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ABSTRACT

This curriculum guide is composed of three units. Each unit has three chapters, and each chapter has six lessons. The objectives of the course are to develop an awareness of and information about energy conservation, as well as to improve inquiry skills and participation habits. Each set of lessons covers the full range of objectives in the course. The first unit is for grades K-1. The second unit is primarily for second and third graders, and includes lessons about physical and human resources involved in the energy problem. The third unit, for grades 4-6, explores ways in which people are facing the energy problem and actions they are taking. This unit requires the students to undertake a major project of their own about the conservation and use of energy. (BB)

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Lessons From An Energy Curriculum for the Elementary Grades

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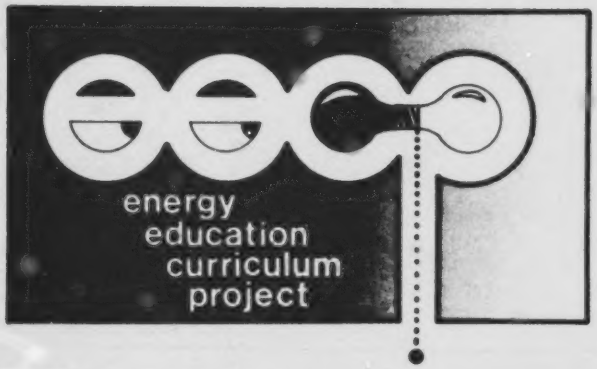

Indiana Department of Public Instruction
Harold H. Negley, Superintendent

Indiana Department of Commerce Energy Group
William J. Sorrells, Director

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LESSONS

from

AN ENERGY CURRICULUM FOR THE ELEMENTARY GRADES

Division of Curriculum
Indiana Department of Public Instruction
Harold H. Negley, Superintendent
Energy Group, Indiana Department of Commerce
William J. Sorrells, Director

October, 1978

The Energy Education Curriculum Project was coordinated by the Indiana Department of Public Instruction, Division of Curriculum with the support and assistance of the Indiana Department of Commerce Energy Group.

These materials were authored by Judith A. Gillespie of the Energy Education Curriculum Project and were developed at the Social Studies Development Center at Indiana University, Bloomington. Joel Pett has served as artist for the project and has developed all of the illustrations. Mary Soley aided in the development of these materials.

John A. Harrold, Director of the Division of Curriculum and consultants from the division have worked closely with the developers of the materials. Jerry Colglazier, Senior Consultant; Catherine Haynes, Early Childhood Coordinator; Kathleen Lane, Energy Consultant; Jane Lowrie, Social Studies Consultant; Martha Mitchell, Elementary Education Coordinator; Victor Smith, Research and Evaluation Consultant; Margaret VanGundy, Energy Consultant; and Joe Wright, Environmental Education Consultant have offered many suggestions which serve to impove these lessons.

Linda Shapiro, Energy Education and Residential Coordinator, Indiana Energy Group, has assisted the project by giving valuable help and suggestions.

These materials have been substantially revised based on comments of teachers throughout the state who piloted the test materials. These teachers and their students have made valued contributions during the summer months, and their help has been appreciated.

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PREFACE

These sample lessons are representative of materials which will comprise a complete Energy Education Curriculum for the elementary grades. Unit One, the first of three units, focuses on "Energy and You" for grades K-1. Unit Two, which is primarily for second and third graders, is entitled "Energy Resources" and includes lessons about physical and human resources involved in the energy problem. The third unit, "Energy in Action", explores ways in which people are facing the energy problem and actions they are taking. Fourth through sixth graders will undertake a major project of their own about the conservation and use of energy. A complete rationale for all three units is contained in a conceptualization paper entitled, "A Plan for an Energy Curriculum for the Elementary Grades." It is available upon request from the Division of Curriculum of the Indiana Department of Public Instruction.

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INTRODUCTION

Most of us can point to some part of our lives that involves avoidance behavior. We postpone a medical check-up. We "forgot" to vote in local elections. We tune out fairly explicit messages from our family that a vacation is long overdue. Until we arrive at the hospital emergency room, are scandalized by political corruption, or are threatened by family exile, we do not normally act. We all do it. Avoidance is a common pattern in our lives. We must set priorities, for there is only so much attention we can give to a wide range of problems.

The energy problem is basically one of avoidance for most of the American public. People hear about the need for energy conservation through the media. They tune out these messages as problems of work, home, and school appear more pressing. Fuel becomes more expensive. Brownouts increase. Model solar homes dot communities. Still, most people push the problem aside for today, and most likely, tomorrow.

Because of this avoidance, solutions to the energy problem must focus on changing patterns of people's everyday lives, and priorities for energy conservation and the use of alternative technologies must be raised. The President cannot change these patterns and priorities, at least, not alone. The people must. And they must start now.

Because the problem is essentially one of changing priorities and life-style patterns, then energy education rests at the core of the problem-solving process. Policy pronouncements help, but the 55 mile per hour speed limit continues to be flagrantly violated. Economic incentives help, but heating bills in most homes continue to rise, and are generally paid. Coal strikes raise the visibility of the problem, at least for those who are less creative than some third-grade students at an Indiana school; who put ice cold cloths on their thermostat in order to raise their classroom temperature.

Education is important because establishing and changing behavior patterns are the essence of its definition. The current Commissioner of Education, Ernest L. Boyer, puts it this way:

> "The energy crisis we now face will require not only new technology, but new values and new attitudes as well. We must change our habits of consumption. We must approach self-indulgence with a new perspective--an understanding that we are members of a human community, with a common plight and a common fate. And all of this is closely tied to our nation's schools and colleges."

Indeed, the need is one of human survival, and the schools have a major role to play.

These materials deal with one small, but significant, part of the need for energy education. The Energy Education Curriculum Project aims to develop, evaluate, and disseminate a set of curriculum materials for use in the elementary (K-6) grades. It begins at the beginning, at least as far as most schools are concerned.

Curriculum Goals and Objectives

There is a wide range of goals and objectives which could be developed for any energy education effort. What is disconcerting about most guidelines set out by states, private organizations, or the schools themselves, is that they lack an integrated conceptualization of what they are about. There is no image of the personal or societal outcomes which should result from the materials. There is a set of informational and skill guidelines for which relatively isolated and independent activities are developed. The attempt here will be to develop a systematic conceptualization of an effective energy actor as the outcome of instruction and to delineate principal competencies such an actor must attain.

The conceptualization begins with an image of a person. This person can be called an "effective energy actor." In this case, the word "effective" means that a person has the awareness, knowledge, skills, and habits necessary both to conserve energy in his or her everyday life, and to understand and utilize new technologies and new energy sources. "Effective" means both thinking about energy problems and acting in relation to them. Without both thinking and doing, a person cannot be effective in relation to the energy problem.

This idea of an effective energy actor serves as a foundation for an important set of objectives for an elementary school energy curriculum. First, an effective actor must be aware of energy resources, uses, and issues. Awareness is a major stimulus for action. Second, an actor must have information, or knowledge. Without information, action can be either irresponsible or ineffective. Third, an actor needs basic inquiry skills--asking questions, finding information. These skills help people to put knowledge to use. Finally, using knowledge and skills to develop important participation habits is the linchpin in the equation for effective action on energy issues.

These four competencies are the key to the general goal. When they are integrated together, they constitute the essential characteristics of an effective energy actor. Each competency is itself important. When they are combined, a powerful multiplier is put into place which maximizes the potential contribution an individual can make to as universal and significant a problem as the energy problem.

What are the reasonable expectations for the development of young, effective energy actors? Piaget and other researchers have demonstrated important developmental opportunities and barriers in the elementary years. Students can develop energy awareness, as long as it is self- or peer-centered awareness. They can learn basic information if useful, concrete examples are provided from their everyday environment. They can begin to develop inquiry skills in terms of lower or middle level discrimination of ideas and objects. They can act in simple roles that are self-oriented (student as consumer) rather than group-oriented (Ralph Nader or President Carter). Real limits are placed on comprehension, analysis, abstraction and role-taking. Yet the opportunities are also great.

The central thesis here will be that, given these real limits, students can be effective energy actors in their own everyday environment. They must not wait to become adults. In fact, the world will not wait for them. In theory, they need not wait; rather, they can develop basic, very basic, attitudes and behaviors which will grow in dimensionality over time.

Roger, a third grader, serves as an example. Roger is a young, effective energy actor. He is aware of his own energy resources (physical, mental, emotional, etc.) and those around him. He cares about turning out lights at home and school. He raises questions about energy use in his community environment. He even participates in designing a conservation plan for his school.

Roger continuously practices what he believes. He walks to school and friends' houses. He tries to get others to do so. He participates in family decisions about energy use. He works with classmates to conserve energy at school. He talks with young (and older) friends about new ways to confront energy problems in his own everyday environment. He sets a model, and acts to improve energy situations wherever he sees them. In these ways, Roger may have a significant impact in his own everyday world, both now and in the future.

Therefore, the main curriculum goal will be to provide instruction which will promote effective energy actors, of which Roger is a model for elementary students. Four sub-goals involve the development of competencies in awareness, information, inquiry skills, and participation habits. Each of these four sub-goals serves as a general domain for the development of specific instructional objectives. These objectives are highlighted in the list on page i.x.

Curriculum Plan

There are a variety of ways that the objectives stated could be sequenced and orchestrated into curriculum materials. The Energy Education Curriculum Project materials will include several components. They will begin with a rationale which will provide teachers with a basic conceptualization of what the curriculum materials are intended to do. The rationale will demonstrate how materials fit into the K-6 social studies/science curriculum. General objectives will be set out next. A set of well-integrated social studies/science lessons will be developed which will have short rationales and concrete objectives specific to each lesson. They will be hands-on lessons that can be used by teachers in elementary social studies and science classes. Each set of core lessons will also be provided. Finally, the materials will include an annotated bibliography which will stress supplementary materials both for teachers and for students.

The curriculum can be used flexibly. The complete sequence for the curriculum is outlined on the following page. Unit I, "Energy and You," is designed to be used for K-1 students. Unit II, "Energy Resources," is designed to be used at 2-3 levels. Unit III, "Energy in Action," is designed to be used at levels 4-6. Each unit has three chapters, and each chapter has six lessons; therefore, there are eighteen lessons in each unit. Each set of lessons covers the full range of objectives in the course, and adaptations are made for other grade levels, for language arts, and/or math subjects.

OBJECTIVES

AWARENESS

1. Students will demonstrate interest in the ideas of energy conservation and alternative uses of energy, as well as their roles as energy consumers and citizen (group) problem-solvers.

2. Students will recognize fundamental energy resources, their use and distribution as well as the basic characteristics of their consumer and citizen roles.

3. Students will demonstrate concern by rating energy and their roles in the energy situation as high priority problems.

INFORMATION

1. Students will know and use the concept of resources (human and physical) in identifying energy problems in their own everyday environment.

2. Students will know and use the concept of outcomes (physical and human) in assessing solutions to energy problems in their own everyday environment.

INQUIRY SKILLS

1. Students will ask clear and significant questions about energy and their roles in the energy problem.

2. Students will gather evidence related to energy questions.

3. Students will articulate their values and apply them to energy situations.

4. Students will speculate about alternative futures in energy use and problem-solving.

PARTICIPATION HABITS

1. Students will practice consumer roles in energy situations in their everyday lives.

2. Students will practice individual and group decision-making roles in groups which are important to them in their home, school and community.

CONTENT OUTLINE

I. Energy and You

A. Person Power. Basic awareness activities. Identification of human energy which is part of students' everyday lives. Personal energy inventory.

B. Energy in Your Home and School. Basic awareness, information and inquiry skill activities (question-asking). Identification of physical and human resources in local environment. School energy survey.

C. The Energy Problem. Basic awareness, information, and participation activities. Students see concerned actors make a difference and learn about actions they can take.

II. Energy Resources

A. Energy in Your Community. Continue awareness. Information about human and physical resources and relationships. Introduce evidence-gathering skill. Resources of different types of energy actors.

B. Using Energy. Awareness. Information about how resources are used. Apply evidence-gathering skills. Consumer role in relation to use.

C. Energy Habits. Develop information and concern over patterns of use. Apply evidence-gathering skills. Practice good energy habits and how to change habits.

III. Energy in Action

A. Energy Coming and Going. Focus on energy transformations -- sources to products. Develop interest. Develop citizen role. Students do experiments and map physical and human historical and physical origins of energy use.

B. Solving Energy Problems. Recognition of important problems. Apply action processes to community, etc. Develop valuing skills. Group decision-making skill as part of citizen role and problem-solving.

C. Energy Outcomes and the Future. Develop concern and concrete action alternatives. Know human and environmental outcomes. Model personal studies. Practice valuing skills. Major individual/group/class project to apply information, inquiry skills, participation.

This introduction has been designed to give a brief overview of what the project is about. Actually, the Energy Education Curriculum Project is not only a curriculum project. Evaluation of the curriculum materials has been done in schools throughout Indiana. Teachers and students in these schools have provided valuable feedback. An evaluation report on the pilot test of the materials will be available later in the fall. Dissemination work is also being done. Brochures, conceptual plans, and the materials are being distributed by the Division of Curriculum to any teacher in Indiana or outside of Indiana who wishes to use the materials.

The project is a growing project. It will, in effect, never be permanently fixed in stone. The more comments, advice, and ideas that are received about the materials, the better the project will be. If you would like to contribute ideas or advice to the project, or if you would like to have more information about it, please contact the author or Kathleen Lane and Margaret VanGundy, Energy Education Consultants, Division of Curriculum, Department of Public Instruction, 229 State House, Indianapolis, Indiana.

UNIT I: ENERGY AND YOU

Unit I consists of three chapters. Each chapter contains six lessons. This sampler has four sample lessons from various chapters in the unit.

The objectives for Unit I include increasing students' awareness about energy, chiefly their own personal energy. Knowledge is also a primary goal, so that students can learn some useful things about energy which they can apply to their own everyday lives at home and at school. Inquiry skills are taught so that students can ask better questions about energy. Finally, students learn some basic participation skills which allow them to act on energy problems that they face every day. It is our belief that the linkage between awareness, knowledge, skills, and participation is fundamental for students to become more effective energy actors.

Chapter 1 focuses on "Person Power." It makes students aware of how they themselves are important sources of energy. Students study physical, intellectual and emotional energy that they have and that they use every day. The lesson that is included in the sampler is the introductory lesson, which focuses on awareness of human energy. It is designed to introduce students to how they themselves are sources of personal energy and to get them to see the idea of energy in concrete, personal terms.

Chapter 2 focuses on "Energy at Home and at School." There are two lessons in this sampler from this chapter. One is a knowledge lesson. We are concerned about students learning about basic energy products that they use every day. They start with a very familiar place, their classroom. As the chapter continues, another lesson is included which is on energy in students' homes. They begin with one room in their home which they use often, and learn about energy products which they use every day. In this second lesson, they also learn about a very basic skill, how to ask questions. Both the knowledge and the skills learned in this chapter are fundamental to promoting students' basic competencies as energy actors.

Chapter 3 focuses on "The Energy Problem." In this chapter, students learn various ways in which they can participate in helping to take care of their personal energy. The lesson that is selected from this chapter focuses on one important type of participation, making decisions, and how students can make decisions about taking care of their own personal energy. These participation skills, such as decision-making, are the fundamental link in the chain of skills which help students to be effective actors on energy issues.

These lessons can be used individually, as they are presented in the sampler. They are designed to be used in sequence with K-1 classes. They have adaptations for various grade levels and for language arts and math subjects. The lessons in the full set of curriculum materials also include assessment activities through which students' achievement of major objectives for the course can be assessed by teachers. These assessment activities focus on particular topics and objectives in each of the three units in the course materials.

LESSON 1-1: WHAT IS PERSON POWER?

Rationale

This lesson is the first of a series of activities which focus on human energy, or person power. Energy can be divided into human and environmental parts. Here we introduce the human part with an activity on one aspect of human energy -- physical energy. In later lessons, students will learn about intellectual, emotional and other human energy (even later, they will learn about environmental energy).

"What is Person Power?" is designed to promote awareness, not knowledge. Students will think about, act out, and become curious about themselves as sources of energy. Hopefully, they will have fun as a stimulus for later learning. This is the beginning, not the end, of a discovery of personal energy.

Objectives

Students will gain awareness of themselves as sources of energy. Teachers can assess the attainment of this objective by students' description of their daily energy use in Part G of the main activity.

Main Activity

A. 1. Select a heavy object in the room or school grounds. Ask the students to help you move the object.

or

2. Ask students to move some desks or tables in the room.

or

3. Play a game such as jumping rope or throwing a ball that involves the students using their physical energy.

B. Discuss with students what they did, asking how they were able to perform the task in A. Use responses such as "I am strong" to get them to talk about their own physical strength. You may want to use the following questions to guide the discussion:

1. What did you just do? (i.e., moved a table)

2. What helped you to do it? (i.e., my strength, my arms, my energy)

C. Now write the word "energy" on the board, or on a big sheet of paper. Discuss with students how they used their energy in Activity A. Energy is "what we use to help us do things." We use energy to help us do things every day. Students should see how they have just used energy to move something or play a game. Have students draw an example of energy they use, or have them act out using energy in class or on the playground. Students might act out playing a game or riding their bikes, walking or running. Be sure that students understand that energy involves motion. It is not energy unless it is used to do something.

D. Use pictures 1-1 through 1-5 to show people using energy. Ask students to describe the actions that the boys and girls are doing in each picture. Ask them what energy the actions require.

Picture 1-1: Girl brushing teeth. This takes arm energy.

Picture 1-2: Girls and boys raising hands in class. This takes arm energy too.

Picture 1-3: Girl riding tricycle. This takes leg and arm energy.

Picture 1-4: Girls and boys jumping rope. It takes leg energy to jump, and arm energy to move the rope.

Picture 1-5: Boy finishing race. This takes leg energy, but also breathing and heart energy.

E. You can have students color the pictures. As they are coloring, you may want to discuss their pictures with them individually, and show how the boys or girls are like or unlike them in using energy.

F. Discuss the fact that people have energy, and we use our energy every day. Help students to see how energy is important to us every day by discussing the following questions and listing students' responses to Question 1 on the board or paper under the word "energy."

1. What did you do yesterday or today which used your energy? (i.e., ran, walked, played ball)

2. What things on the list would you not be able to do if you had no energy? (i.e., almost everything)

3. Why is energy important to you? (i.e., because everything we do requires it)

G. Suggest to the students that they can call their energy their "person power." Ask them to make a list (in their heads or on a piece of paper) of the energy (person power) they use from the time school ends that day until they leave for school the next morning. Tell them members of their family can help them.

H. When students return to class, have them describe their uses of their person power. Write their items on a big sheet of paper that can be saved with the word "energy" at the top.

Grade Level Adaptation

2-3: You may want to substitute different pictures from those which students have drawn, or from magazines. You may also have the students keep a written list for more than one day.

4-6: You may want to substitute stories or newspaper articles which show how different people use energy. Articles from the sports section of your local newspaper may be very effective. You may also want students to select a famous person or event you are teaching about and write an essay about the use of energy rather than keeping logs.

Language Arts Adaptation

K-1: Have students add words to their list of energy from other activities they do in class, and learn to read them to the class.

2-3: Have the students pick out acts using energy from a story they are reading.

4-6: Have the students write a short story about how they best enjoy using their person power, or when they did something that made them feel strong. Share some of these with the class and/or post them for everyone to read.

Math Adaptation

K-1: Use the pictures from Activity D to help students to learn the concepts of "more" or "less" energy. Does it take more energy to brush your teeth, or to ride your bike?

2-3: Have the students practice addition by adding up the total number of responses from their list in Activities D and F. What is the class total?

4-6: Have the students practice addition and division using the number of items for the class? If arm energy is subtracted, what is the new total? Find the average for each class member by dividing the total number of items in the class by the total number of students in the class.

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LESSON 2-2: ENERGY IN YOUR CLASSROOM

Rationale

This lesson focuses on environmental (non-human) energy in your classroom. It gives students an introduction to some basic knowledge about energy and its use. Students then apply their knowledge to their classroom activities.

Lesson 2-2 promotes basic knowledge (students will learn more about environmental energy later). It is based on the idea that students need to have information in order to be effective energy actors. They also need to be able to apply that knowledge to a close-to-home reference point, the classroom in which they learn things every day. In later lessons, they will see how environmental energy is used in their whole school and home.

Objective

Students will know basic types of environmental energy in their classroom. Teachers can assess student attainment of this objective through the game in Part E of this lesson, or through Assessment Activity 2-2 at the end of this chapter.

Main Activity

A. Review with students the definition of energy as "what we use to help us do things." Review the definition of environmental energy as "non-human energy we use to help us do things." Then tell students that their classroom is full of environmental energy. Ask them to think about what things are around them that they use to do things. Give them an example of how they use lights to see or crayons to color with. Ask them to be silent for one minute (two, if possible) and look around them for energy. When you think they have had enough time, ask them to tell you what energy they see and how they use it (i.e., pencils to write with) Help them a little bit with ideas if they need them. Write the words "classroom energy" on the board or a big sheet of paper.

B. Now use pictures 2-1 through 2-3 to explore the idea of classroom energy. Ask students what energy they see in each picture. Ask them to look at their own walls, ceiling, desks, etc., to find more energy as you move through the pictures.

Picture 2-1: Ceiling and Wall. The lights give us energy we use to help us see, walk and learn. Heaters give us energy we use to help us keep warm. The sun gives us energy we use to see and to help us keep warm.

Picture 2-2: Wall with Pictures. Chalk gives us energy we use to write on the blackboard. This helps us learn. Paper gives us energy we use for pictures that help us learn and make us happy.

Picture 2-3: Inside a Classroom. Crayons and paints give us energy that we use for making pictures that help us learn and make us happy. Books give us energy that we use for help in reading and learning.

You can probably think of many more examples in your own class. Use it as a reference, and have students point out or pick up and show these objects.

C. Discuss with students how energy is all around them in their classroom. Use the following questions to guide your discussion. Put the answers to Question 1 on the board under the words "classroom energy."

1. What kinds of energy do we use in our classroom? (i.e., heat is used for warmth, crayons are used to color)

2. Why do we need classroom energy? (i.e., we couldn't paint, color, use books)

D. Have students color the classroom pictures in Activity B. Have them add energy objects they use in their own classroom.

E. Tell students that they are now going to play a game. The object of the game is to find the most kinds of environmental energy they use in their classroom that they can actually pick up and use. (i.e., pencils, crayons, paper) Students will work in teams of 3-5 players. They will collect all of the examples of energy they can find in one pile for 10 minutes (or 5 or 15). The team with the most kinds of energy wins. Discuss (and count) the energy objects the students collect. Add more things to their list on the board. Be sure you list the object and its use. Students should see that energy is motion. Declare one team a winner (others are not losers). (Have them put the objects back at the end of the discussion!)

F. Have students gather or draw pictures of classroom energy objects and how they use them. Make a collage that you can put on the wall of all the things that make up classroom energy.

G. Stress the importance of taking care of energy (see Lesson 1-5). Have students talk about ways they can take care of classroom energy (use crayons until they are completely used up). Have them practice taking care of one kind of energy for a week. Discuss with them the importance of their actions as they carry out the activity.

Grade Level Adaptation

2-3: You may wish to collect your own pictures. Students can also make lists of energy objects they use rather than collecting them.

4-6: Students can collect their own pictures as well as articles about each energy object. They can work in groups to develop a class presentation about each object.

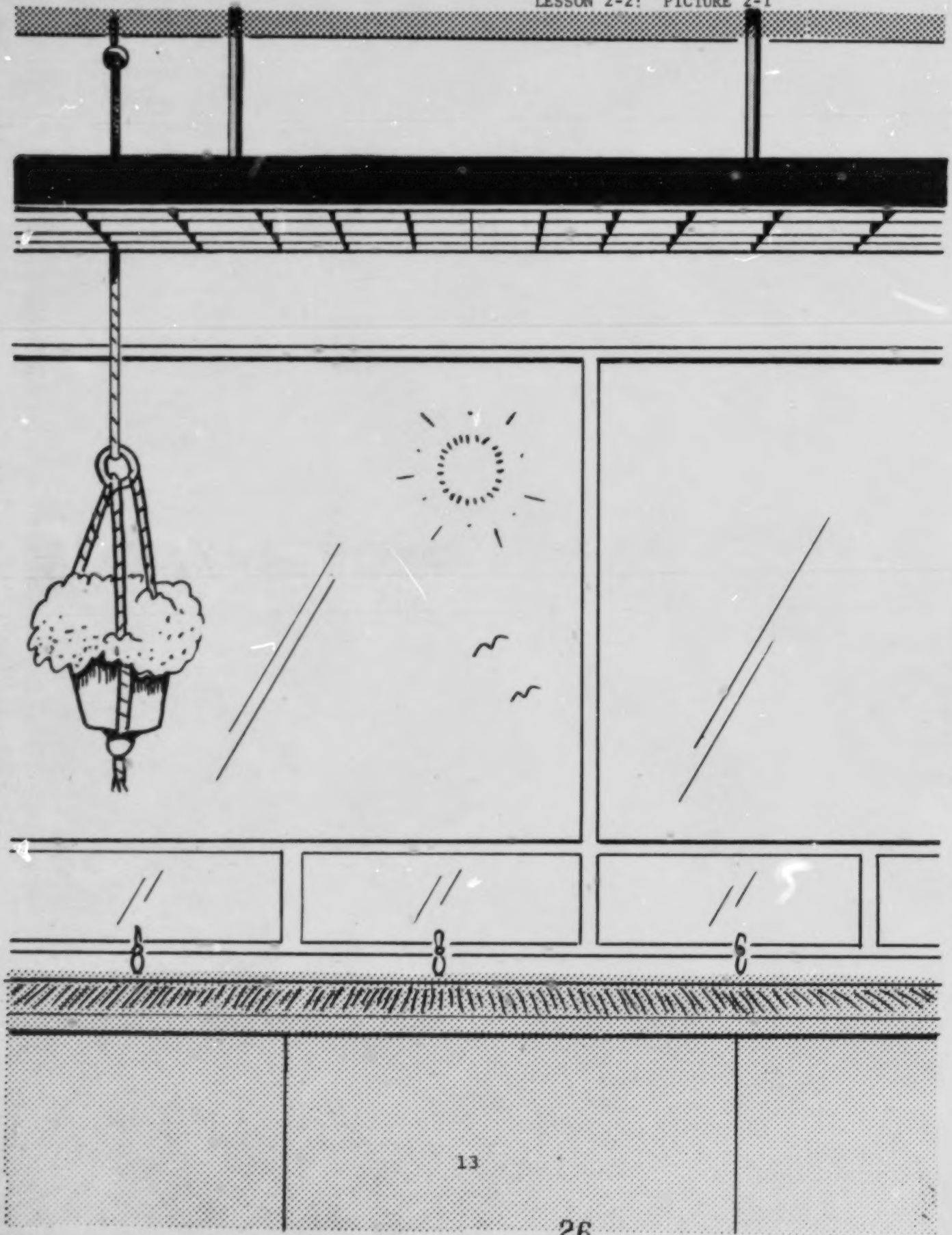
Language Arts Adaptation

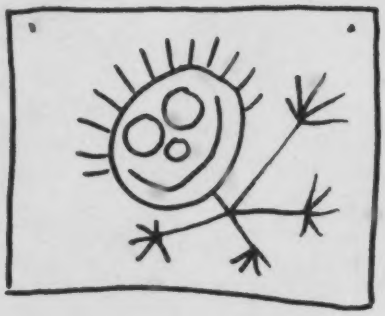
K-1: Have students read the words for each energy object.
2-3: Have the students identify the words for each environmental energy object. They can spell them, put them in one-sentence definitions, or write a short paragraph about the uses of these forms of energy.
4-6: You might want to play a kind of spelling-bee game using energy sources. One side might be given a turn and then asked for both the definition and an application in your classroom. Then the other side would have its turn. Winners would be the team with the last person giving a correct response and example.

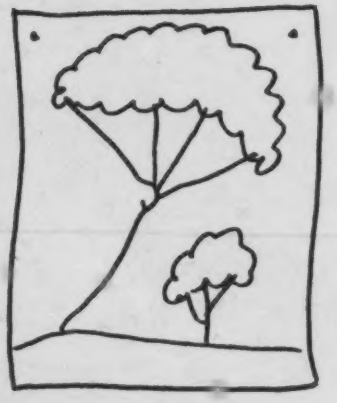
Math Adaptation

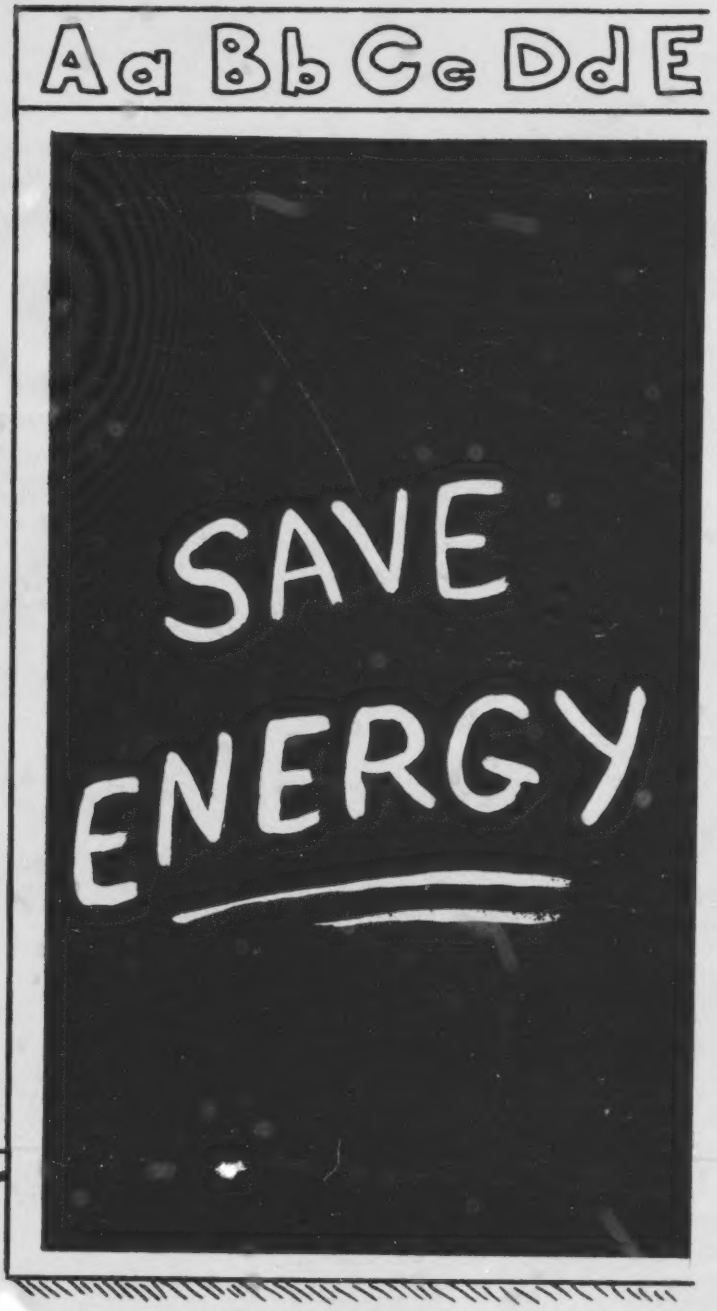
K-1: Students may wish to count the energy objects in their class.
2-3: Have the students count the sources of energy on your list. You can practice addition and subtraction by removing or adding various kinds of energy on the list.
3-6: Students might want to monitor their class (or school) thermostat in order to calculate similarities and differences in the usage of energy in their class and others.

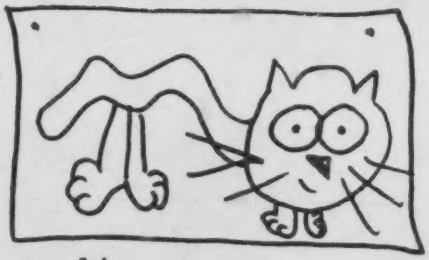
LESSON 2-2: PICTURE 2-1











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LESSON 2-4: ENERGY IN YOUR HOME

Rationale

In previous lessons, students have learned about environmental energy in their classroom and their school. Here they will begin to learn about energy in their homes, beginning with whatever room of the house they use for sleep. Some students will have their own room; others will share a room with other children/adults. Still others may sleep in a living room, etc. The lesson can be used flexibly; its aim is to extend students' awareness and knowledge.

Students will also learn a basic skill in this lesson. Students need both inquiry and participation skills in order to put their knowledge to use. Here we will present one of the most fundamental inquiry skills, how to ask questions. Unless students can ask questions, they will not be able to use their knowledge to find out about more important topics such as energy. Here they will ask questions about how they use energy at home in the room they use for sleeping.

Objectives

1. Students will extend their awareness of environmental energy through a study of their homes. This objective can be assessed by students' pictures in Part B of this lesson.

2. Students will develop skills in asking questions related to the energy problem. This objective can be assessed by carefully reviewing students' questions in Part C of this lesson or by using Assessment Activity 2-4 at the end of this chapter.

Main Activity

A. Discuss with students the idea that, just as environmental energy is found at their school, it is also found in their homes. Ask them to tell you what room in their house they use the most for sleeping, dressing, playing. Then say that in Ron's house, he uses the bedroom he shares with his two brothers the most. Show Picture 4-1 of Ron's room. Ask students what kinds of energy they see in the picture and how they use them. (i.e., lights to see with, toys to play with) Talk with them about how many of the same energy objects are used in the home that they found in school.

B. Ask students to draw a picture of the room they use the most in their home for sleeping, etc. They can take the pictures home and have their family help them. Ask them to think about (and include in their drawing) some energy objects they use every day.

C. Discuss the students' pictures in class, using the following questions to reinforce students' knowledge about energy in their homes:

1. What energy can you find in your home? (i.e., lights, etc.)

2. What energy do you use every day? (i.e., most of what they mention in #1)

3. Why is home energy important? (i.e., we use it for play, dressing, sleeping)

D. Now tell students that in order to learn more about energy they use in their homes, they need to be able to ask questions. Suppose that they wanted to find out more about Ron's room, or about energy in one of their classmate's homes. What questions would they ask?

If they do not know what a question is, explain that it is asking someone else for an answer like: "Do you like to play ball?" "Can you play this afternoon?"

Work with the students to put a series of questions on the board. Three to five questions will be fine. The students' questions should not be criticized at this point. The class should just discuss what possible questions they think would be most important to ask one of their classmates about energy they use in a room at home.

E. You should now teach students about important question-asking skills. You can use the questions that have been put on the board as examples. Have them try to determine which questions are the best questions, in terms of getting important information about energy in their classmate's home.

There are two important parts of good question-asking. The first is that a question should be clear. You should be able to show students how some of their questions are clearer than others, more direct, more to the point, more precise. These questions are better to ask than more vague questions, because they help to get better information.

A second part is that a question should be related to the problem that students are trying to study or the information they need. For example, if a student asks what is the number of people in a family, this question is not necessarily directly related to home energy use. If the students ask questions about the energy use in their bedrooms, then they are asking directly related questions.

Students should then develop two or three more questions which they think will meet the idea of good questions about energy in their classmate's home.

F. Now break students into pairs. Tell them they want to find out as much as they can about energy and how their classmate uses it in his/her room. Have them ask questions to find out. They should then draw a picture of their classmate's room and the energy that is used based on the answers they get. They can ask more questions as they draw.

G. When students have finished their pictures, conduct a class discussion using the following questions as guides. Put the words "home energy" on the board. List students' responses to question #1 under the words.

1. What kinds of home energy did you draw? (i.e., lights to help us see)

2. What questions helped you to get the most information for your picture? (i.e., those that were clear, related)

3. Why do you think asking questions is important to find out about energy? (i.e., you can get more information, you can get new ideas)

H. Now ask students to think about the energy they use in their rooms at home, and the energy their classmates use. Ask them to bring one energy object from home to class which they use a lot (every day). Have them talk with their family about the choice. In class the next day, have the students show their objects to the class. Have them explain how and why they use the object a lot. Have the class ask questions (clear, relevant ones) about the student's energy use.

I. Then remind students that it is important to take care of energy. Ask them how they might take care of the energy object they brought to class. Ask them to try to take care of it for one week. During the week talk with students about how they are doing. Help them to see how taking care of energy is important.

Grade Level Adaptation

2-3: Use pictures from books and magazines. You might want students to draw up more questions and actually write out a survey as individuals or groups.
4-6: Use pictures from magazines or newspapers. You could extend the survey to the entire household. Students could do a survey form.

Language Arts Adaptation

K-1: Have students act out their use of the home energy object they bring to class.
2-3: Ask students to make sentence answers to their questions.
4-6: Have students work in groups to draw up a written plan for energy conservation in their home.

Math Adaptation

K-1: Ask students to measure their energy use at home by counting the number of objects they use in a day. (i.e., the times they turn on lights)

2-3: Ask students to add up the number of answers they get, or subtract some types of answers from their home survey.

4-6: Have students score the survey that they do of their home, in terms of the kinds of responses they get to their questions. You may want them to draw graphs or to work with figures according to whatever basic math function you are teaching in the classroom.

LESSON 3-3: PEOPLE SOLVING ENERGY PROBLEMS

Rationale

Students have learned about the dimensions of the energy problem. Here they will see how people can do things to help save energy. Students will talk about stories in which young elementary students are helping to save energy.

In order to really help save energy, people must act in some way, they must participate. The lesson is designed to teach students one fundamental participation skill, how to make decisions. Knowing this skill should help them to be more effective energy actors.

Objectives

1. Students will recognize how individuals can help in the energy problem. Teachers can assess the attainment of this objective through student discussion of the pictures and/or stories in Part D of this lesson.

2. Students will know basic decision-making skills. Teachers can assess the achievement of this objective by using student responses to one of the stories as a measure of knowledge, or by using assessment activity 3-3 at the end of this chapter.

Main Activity

A. Use Picture 3-1 and/or read the story about Carla to students as an introduction to how people help to solve energy problems. Structure a discussion that centers around what energy problem is involved in the case and how Carla tried to solve the problem. This activity should be a discovery exercise where students speculate about these questions. There should be no right or wrong answers. The object here is to see how one person can solve a particular energy problem.

B. Use the discussion of Carla as a base for beginning to teach the students some basic aspects of decision-making. Ask students what decision Carla made. Write the word "decision" on the board. Carla decided, or made a choice, to turn off the lights in her room. Ask students what decisions they have made recently. Write their answers under the word. Ask them if they have made any decisions about energy lately. Put those decisions on the board also. Help students to see that everyone makes some kind of decision every day.

C. Now use Pictures 3-2 through 3-5 to help students to see the basic parts of decision-making. They involve a story about Leroy and his decision about turning off the TV. You should read the story to students, using the pictures. Then discuss with students these four steps in decision-making:

1. What do we need to know? Finding out or knowing involves gathering information about the question you have. Every decision-maker must have good information in order to make a wise decision. The boy in the picture has information about how TV's use energy.

2. What can we do? We do not make a decision unless we decide between at least two different things. That is what a choice is. Generally, the more different things you consider, the more comprehensive and better your decision will be. It may be a decision about whether or not to do something. There are often positions in the middle which involve doing a wide range of alternative activities. Usually, how many alternatives are considered depends upon how much information a person has. The boy in the picture is deciding between turning the TV on or off.

3. What do we want to do? Choices involve selecting among different things. Students should select among things based on what seems best to do. The boy wants to save energy, so he chooses to turn the TV off.

4. What happens when we do it? There is an outcome for every decision, a consequence. In this case, energy is saved because Leroy turns off the TV and he plays with his friends.

Students should then discuss these four aspects of decision-making in terms of Carla's decision and how she went about making it.

D. Summarize what students have learned about decision-making and how important it is for solving energy problems.

Use Pictures 3-6 through 3-8 and/or read aloud the stories about Mike, Rosa, and George to show students models of different people solving energy problems. Hold a discussion with students about the models along the following lines:

1. What is the energy problem here? (i.e., gas usage, heating)

2. How did the students find out about the problem? (i.e., talked with teacher, father, etc.)

3. What different things did the students think about doing? (at least 2 in every case)

4. What choice was made? (i.e., to turn off lights, use a window patrol)

5. What happened when people did things? (i.e., saving energy, helping others to save)

6. Why is it important to make decisions about energy? (i.e., people will save more; they can help others)

E. Ask students to make one decision about energy and to act on it this week. Tell them to follow the steps they have learned. Be sure to discuss their actions when they are finished in terms of the parts of decision-making, what problems they had, and what energy they saved.

Grade Level Adaptation

2-3: You may want to collect your own pictures, and help students to read the stories.
4-6: Students can use newspaper or magazine articles to illustrate decision-making. They can also write essays on an energy decision they made.

Language Arts Adaptation

K-1: Use puppets to act out one of the decisions in the stories or their own decision in Activity E, and help students practice oral and listening skills.
2-3: Have students fill in the boxes in Picture 3-2 with their own sentences.
4-6: You may want students to draw up their own profiles of individuals to use as cases for this exercise. They could describe these cases orally or do a written essay, giving descriptions.

Math Adaptation

K-1: Have students measure how much energy they save in the decision they make about energy in Activity E. For example, they use less lights or save more light energy.
2-3: Ask students to describe a decision they made in sentences. Have them count, or add or subtract different alternatives in their decision.
4-6: You may want to do some math calculations on the energy that Mike, Rosa or George might have saved by making an individual contribution to the energy problem. If you can offer some figures for total energy consumption, then you can have students subtract, divide or draw graphs of how individual consumption contributes to the total problem.

CARLA'S DECISION

Carla is in kindergarten at Day Elementary School. She likes school. She also likes learning about energy.

Carla knows that part of the energy problem is the way people use lights. She decided that she would try to change her own ways at home.

Carla wanted to get some information about the energy problem. She talked with her teacher. Her teacher called the local light company. The company told her how much electricity Carla used each day. It was a lot.

Carla then faced a major decision. If she could cut using lights in her room, surely her entire family could help even more. She could sit down with her family and talk about using lights. She could just cut her own use of energy. She could then hope that the family would see how savings could be greater. Finally, she could decide not to bother. After all, no one was making her turn her lights out.

She decided that she would cut her own use of lights, and see whether others might follow her example. She decided that if she tried to tell her family, she would not get anywhere. Her brothers and sisters would not listen to her. She did not want her family to get mad at her.

So Carla tried it out. For one month, she carefully used lights in her home. She used the lights only nine hours per week, and cut the family's energy bill by over $4.00. The family became interested in Carla's plan. They began to ask her questions about her use of energy. Soon her brothers and sisters were deciding that they could do the same. Her parents also followed her actions. She helped to conserve energy herself. She had also spread the word to her family through her own actions.

MIKE'S DECISION

Mike is a first-grader at North Beach Elementary School. Mike likes to ride his bike. He also is involved in swimming lessons. Mike learned about energy in his first-grade class. He worried about the amount of gasoline energy used by cars. It seemed as if everybody drove cars everywhere, even if it was just down the street.

He wondered if he could do something about his own use of gasoline. He was too young to drive, but he did walk a lot. He could do something about family use of gas if he did not ask his Mom and Dad to drive him everywhere.

He talked about the problem with his father. His father said he would help him. For a whole week, Mike and his father counted his use of the family car. When he was being taken to a lesson, or a game, or out for an ice cream cone, he and his father counted how many miles they drove. By the end of the week, he was surprised. He found out that the family actually drove him almost 100 miles per week. There should be some way to cut down on gasoline use.

He then made a decision. He could walk everywhere. He really did not need to have the family use the car. He might decide to walk to a few of the places, and to have his Mom and Dad drive him when it was a longer distance. Finally, he could try to get his parents or neighbors to save on their gasoline use.

Mike decided not to try to change his parents or neighbors. They might not think it was very important. He did think that he could try to walk more.

Mike tried it for a week. He began walking everywhere. He walked to baseball practice. He walked to his swimming lesson. Soon he found that his friends began to walk with him. It was a lot of fun.

Mike liked his decision. His parents were very happy. His friends enjoyed walking with him. They, too, were saving energy for their families.

ROSA'S DECISION

Rosa is a first-grader at Woods Elementary School. She was learning about the energy problem in her class. She felt that there was a way that the school could help.

She wondered what to do. Rosa decided to talk to her teacher. He said that one of the major ways the school used energy was through heating. Woods School was in a town where it was cold and the heat was turned up to 75-80° in the winter. He said that the heat could probably be cut down. It would save the school a lot of money. People would only need to agree to dress more warmly.

Rosa thought about the problem. She remembered what her teacher said about cutting down the heating.

She could start a window patrol. Windows were often left open in the school while the heat was on. During recess, doors were often left open while the heat was on in the winter. She could also try to get people to wear sweaters and turn down the heat. Rosa talked with some other students. They made a plan. They wanted the students to patrol the opening of windows and doors.

Rosa took the plan to her principal. The principal agreed. Students in each class were put in charge of the energy use. There were very few windows and doors left open during the winter. The patrol did a good job.

The plan worked. The school cut down its heating bill because of the students' energy ideas.

GEORGE'S DECISION

George is a third-grader at Central Elementary School. He was learning about energy in his science class. George found out that dishwashers were one of the major appliances that used energy.

The dishwasher was used a lot in George's home. The family had five children, and there were a lot of dishes after every meal. They also were about to get a new dishwasher. George talked with his mother. She thought it was a good idea to try washing the dishes and delay getting a new dishwasher. They went to the local appliance store. They found that their dishwasher used a lot of energy, and any new one would use a lot, too.

George wanted to cut back on the dishwasher, but it was difficult to think of a plan. He could do the dishes, but he did not want that! After all, doing that many dishes every day was going to be hard. He thought that he might ask his sister Alice, who was 14, to help him do the dishes.

He talked to Alice about his plan. Alice was not happy at first. She said she would rather dry the dishes than wash them. She said that she would try it for a week. If it worked out well, then they could do the dishes together. George's mother was very pleased that Alice would help. Maybe they wouldn't need an expensive new dishwasher.

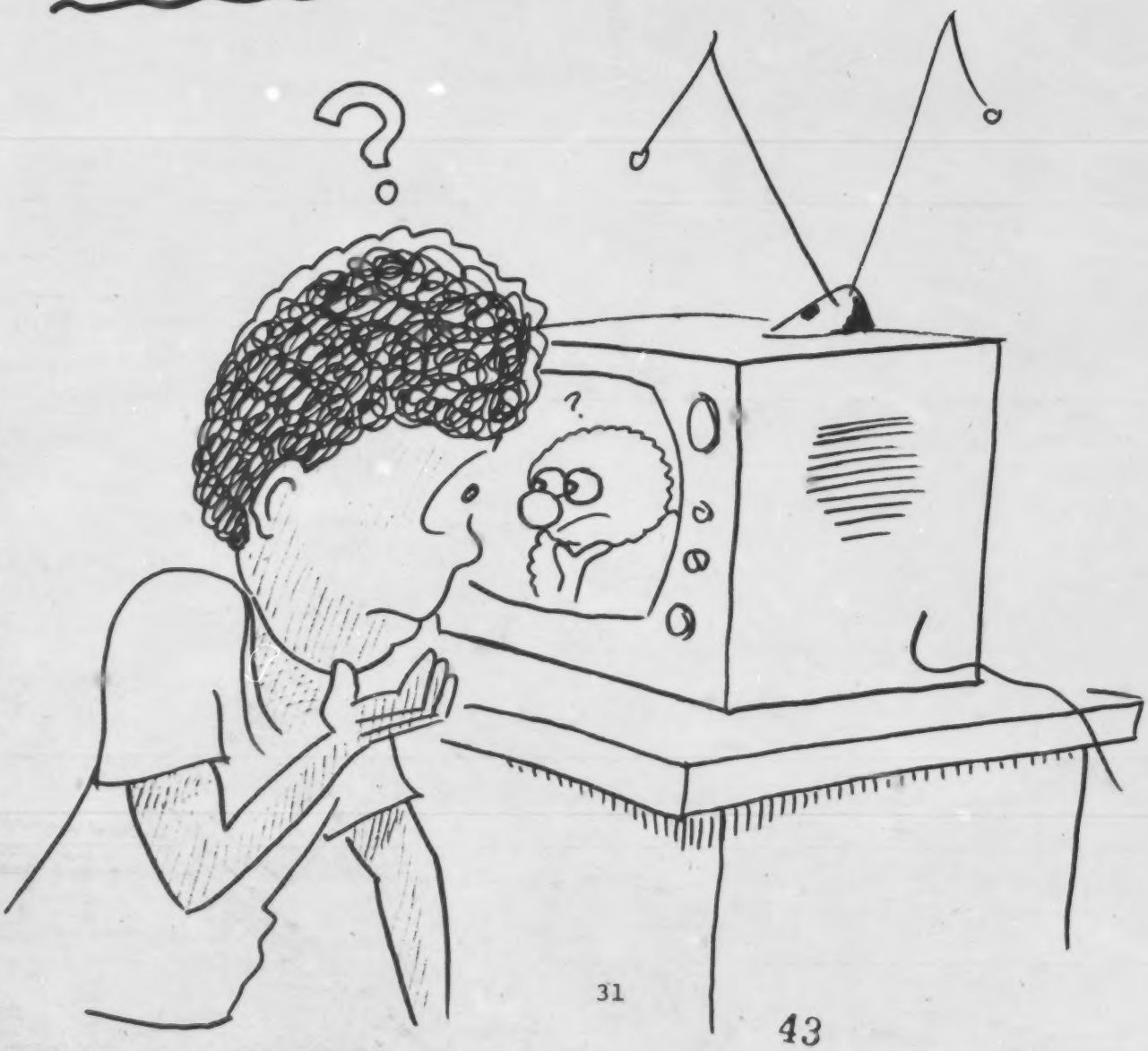
It did work. Alice and George enjoyed doing the dishes. They talked to each other about what had happened at school, and with their friends. Soon, their sister Mary was also part of the dishwashing team. This way, when someone had a game or some other activity they wanted to do, others could do the dishes for them.

George's decision worked. They saved $5.00 that month on their energy bill. Soon, the whole family was helping. They never did buy the new dishwasher.

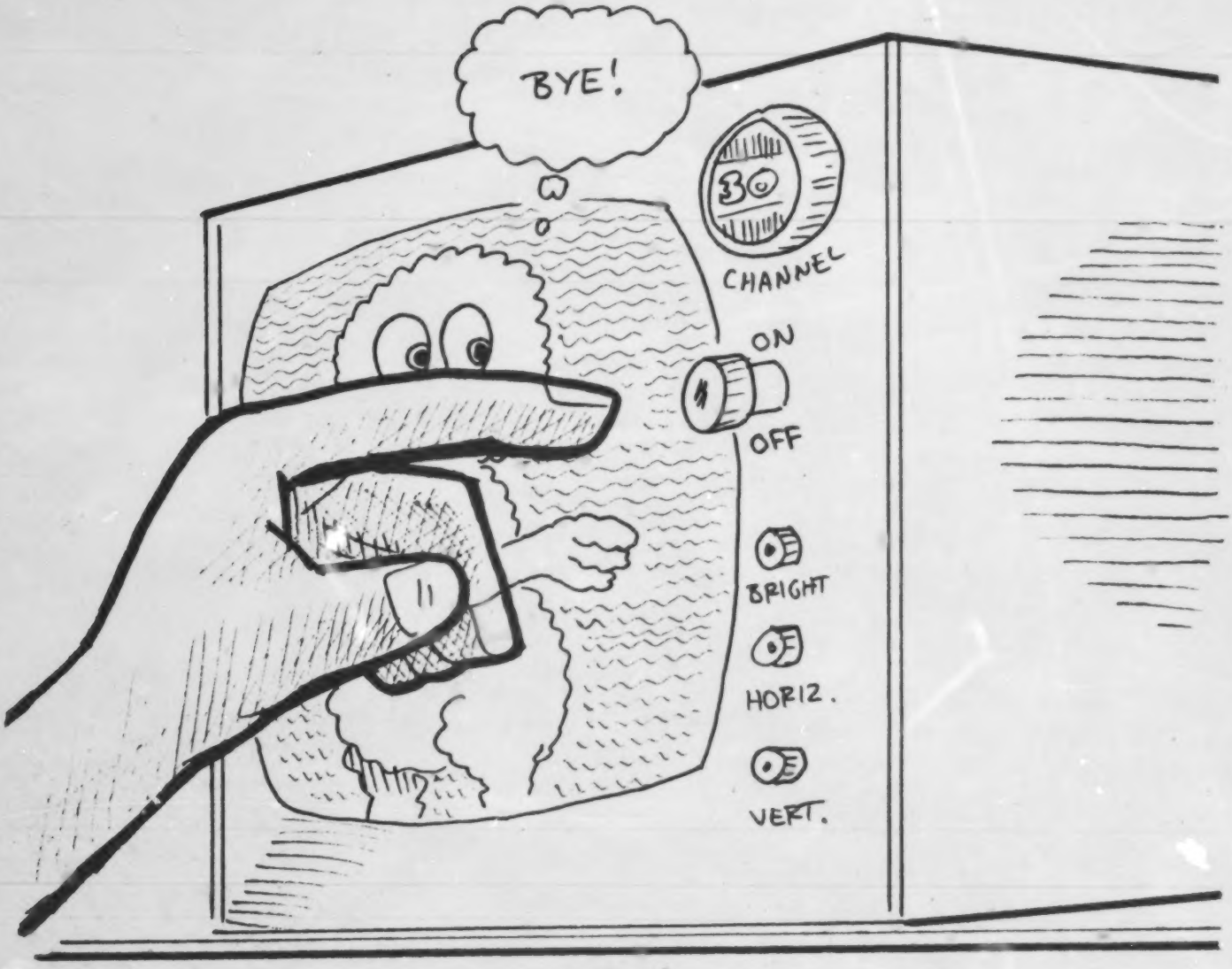
LESSON 3-3 PICTURE 3-1

WHEN LEROY FOUND OUT THAT T.V. USES A LOT OF ENERGY, HE WAS VERY SURPRISED...

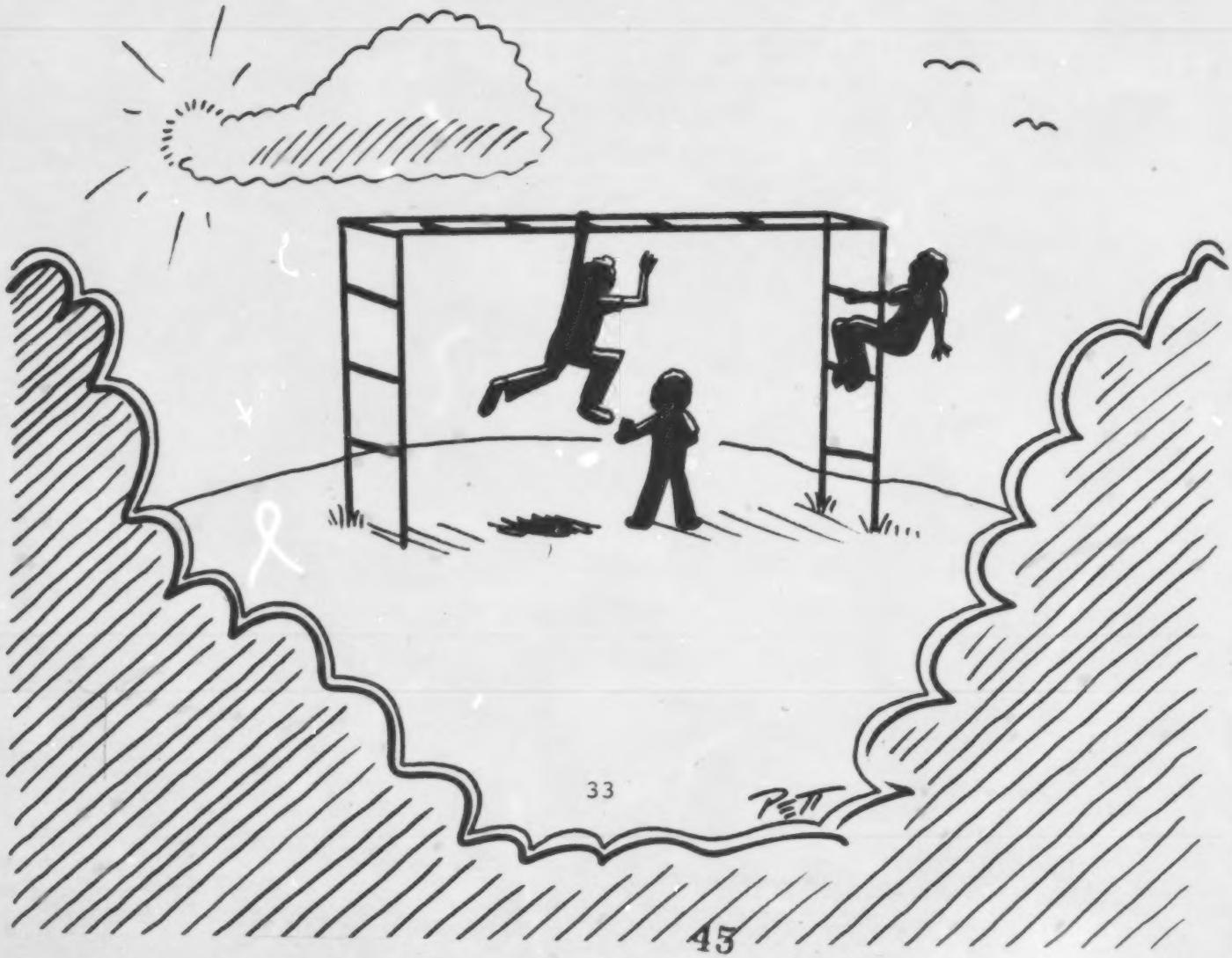
WHAT COULD HE DO? WELL, HE COULD LEAVE IT ON, BUT HE FELT HE SHOULD TURN IT OFF...



SO LEROY MADE A CHOICE - HE TURNED OFF THE TELEVISION



AND, HAVING CHOSEN NOT TO WATCH ANY MORE TELEVISION, HE WENT OUT TO PLAY.



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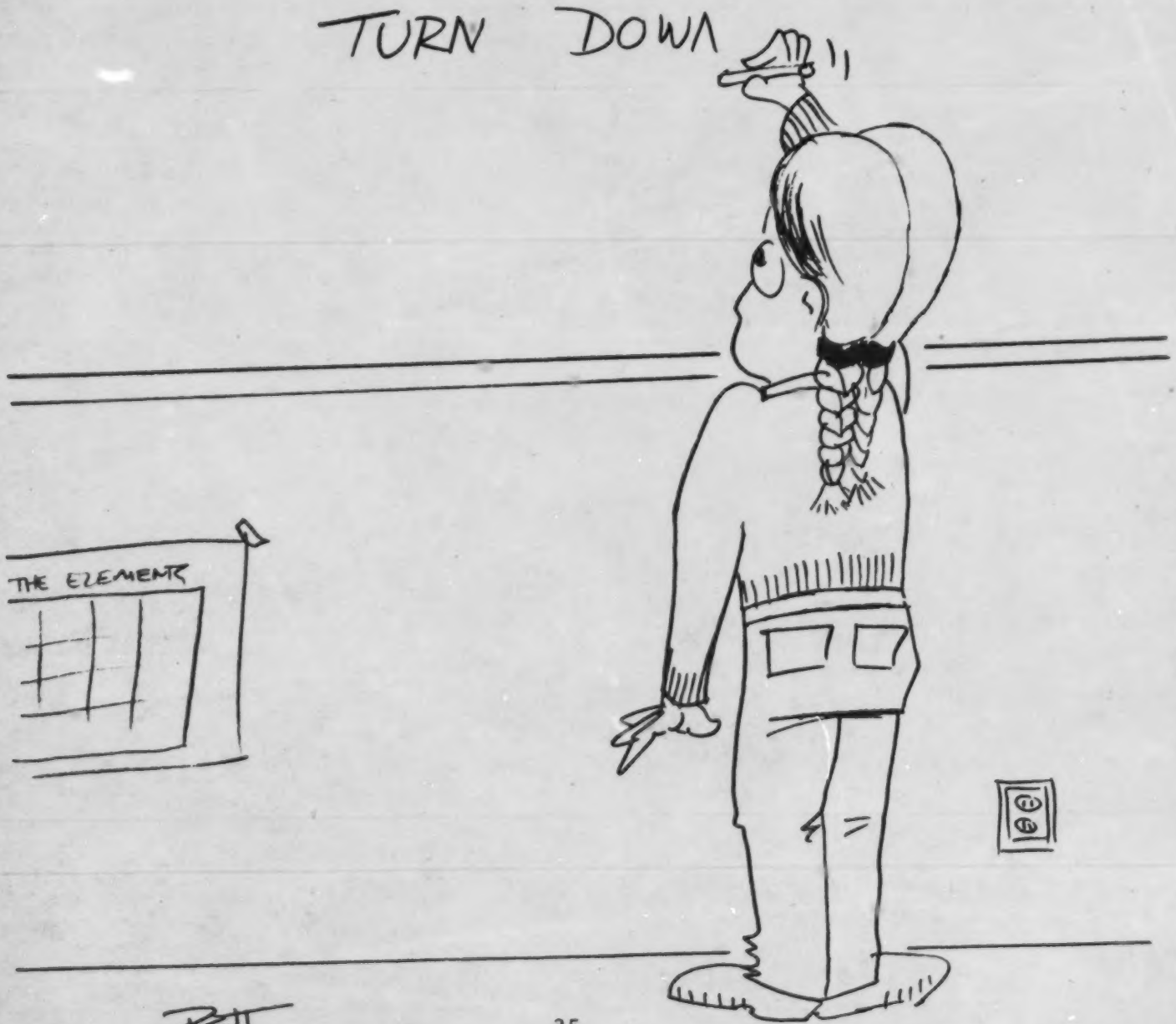

TURN DOWN
THE ELEMENT

POP!

UNIT II: ENERGY RESOURCES

Unit II focuses on energy resources in the students' community and how they can develop good habits of energy use. The unit contains three chapters. Each chapter has six lessons. This sampler contains four lessons from various chapters in the unit.

The objectives of the unit include making students aware of energy resources in their community and how to take care of them. A primary focus here is on awareness of energy habits, or ways people use energy on an everyday basis. Knowledge goals stress identifying energy resources in the community and basic ways of saving and wasting energy on the part of community participants. Skills include those of gathering evidence, or helping to find information about energy problems. The participation skills taught are chiefly those of how to change habits of energy behavior so that students can be more effective energy actors. All of these objectives link together in a powerful multiplier which allows students to transfer knowledge and skills into their own everyday activity.

Chapter 1 focuses on "Energy in Your Community." Two lessons from this chapter are contained in the sampler. The first lesson focuses on awareness. It makes students aware of places in their community environment where energy is used. Students then learn about various aspects of the community and how people and groups use energy. The second lesson in this sampler focuses on one type of group in the community which uses energy, - service organizations. It teaches students how basic youth and adult service organizations use and conserve energy. It also teaches the basic skill of finding information, or gathering evidence, so that students can make statements about energy use based on sound information.

Chapter 2 focuses on the uses that are made of energy. It highlights energy waste, energy conservation, and the use of alternative energy sources. The lesson which is included in this sampler teaches students various ways in which people waste energy, and how to do something about it.

Chapter 3 focuses on energy habits. Students learn about good and poor energy habits. They begin to see how groups of people can make the energy problem worse, and what can be done to change important habits. In the lesson included in this sampler, students link their knowledge and skills about energy to learn about how they can change their own habits of energy use.

These lessons can be used individually as they are presented here. They are designed to be taught at grades 2-3 in a sequence, with adaptations for other grade levels and language arts and math subjects. The chapters in the full set of curriculum materials include activities for each of the major objectives in the course.

LESSON 1-1: COMMUNITY ENERGY

Rationale

Students have learned in Unit I about energy at home and in their school. Here they will begin a study of energy in their community. They will see how using human and environmental energy is an important part of community life. The purpose here is to create awareness about various places and people who are energy consumers in the communities where students live. This lesson is a beginning. Students will study various parts of their community and how energy is used in depth in later chapters.

Objective

Students will become aware of places and people that use energy in their community. Assessment of this objective can be made by students' responses to the general summary questions and Activity H of this lesson.

Main Activity

A. Bring a map of the community where students live to class or have the class design a map. Ask students to locate their school on the map. Mark the place for them. Also have them locate generally where they live, or where they go to church, or where a local restaurant or another common point of reference is. Show them that the map outlines the places that are contained within their community. Normally, communities have names. Even if you are part of a central city, you have a familiar section which defines your community. Show students the boundaries of the particular community in which they live. Ask them for ideas about what buildings are part of their community and what people are part of their community as you have drawn it.

B. Use the pictures that are enclosed with this lesson (Pictures 1-1 through 1-5) to help students explore the idea of community. Tell them that a community is a city or a town, or a part of a city where people act together in doing things. Tell them that the pictures show them parts of the community that are important parts of their everyday lives. Discuss with them what buildings are shown in the pictures, what people are shown in the pictures, and how they contribute to the community.

Picture 1-1: School. There are probably several schools in your community. You might want to point them out on the map that you have found of your community. Students should see that it is a school, and that schools involve people such as students, teachers, principals, and parents from the community acting together.

They work together in order for students to learn things that are important to them in their everyday lives.

Picture 1-2: Family. Families are very important parts of communities. There are probably many families in your community. If students have located where they live on the map, they can see how many families comprise the community. Families work together in order to contribute to the community. They live there, often work together, and often play together, as part of community life.

Picture 1-3: Recreation Center. Recreation centers are also important parts of communities. Locate some nearby centers on your map. They involve students, parents, and other community members in social activities, sports events, and community meetings. In many cases recreation centers have been at the heart of community life.

Picture 1-4: Factory. People also work in communities. Many people work in factories; others work in small businesses. These places are the support for the community. If most people could not work, they would not live in a particular community. They may also work outside of the community itself. Locate some factories and businesses on your map.

Picture 1-5: Government. All communities have governments. Governments make laws which people must obey. Without a government, community life would be very disorganized. Locate city/town hall on your map.

C. Ask students to color any of the pictures 1-1 through 1-5. Talk with them individually about what they are coloring, and how those places and people contribute to the life of their community.

or

Have students bring in their own pictures about places and people in their community, and then make a collage which represents how their community is seen by students.

D. Explain to students that every community uses energy much like their homes use energy and their schools use energy. Their whole community uses a lot more energy.

Explain to students that people are the main energy users in any community. People make choices about what they will do. Every time they decide to drive a car, for example, they decide to use

energy. The chief way people use energy is in driving cars. People drive cars many places: to work, to school, to a baseball game. Cars use gasoline. Gasoline is a very scarce energy source. The second main way people use energy is in the homes. Homes are a major energy consumer because heat and lights are important parts of living at home. Have students find some places where cars go on major streets and where homes are on their map of their community.

Put the words "community energy" on the board or on big sheets of paper, and list under it "people drive cars", and "people live in homes" as major users of energy. Have students give examples of how people use energy by driving cars and by living in homes that use energy.

E. Now talk with students about a study that they can do as a class. Indicate to them that cars are major consumers of energy in communities. They can study the use of gasoline energy by finding out some things about how their family, relatives or friends use their car. Indicate to students that they need to find out one thing which will contribute to the study. They need to determine for any one day (or the weekend, time between the time school ends and the time class begins the next day, or two days, etc.) the following thing:

> How many miles did their family, relatives, or friends drive using their car?

Students will bring the mileage figures to class. You need to do some calculations in order to make these figures meaningful to them. The purpose of the activity is to show students how miles relate to dollars. It is not the purpose here to teach students the calculations. In order to prepare for the class activity, use the following figures for calculating the cost of driving a car.

1. Miles driven = 100 (hypothetical)
2. Miles per gallon = 18 (national average)
3. Gallons used = 5.5 gallons (divide 1. by 2. or 100 by 18)
4. Cost of gasoline = $.70/gallon (national average)
5. Total cost = $3.85 (multiply 3. by 4.)

The formula for computing total cost can be stated as follows:

1. ÷ 2. = 3.
3. x 4. = 5.

You can use the averages for number 2 and 4 or you can use actual figures from your community.

F. Work with students to determine how much gasoline the class uses during the time period that you have selected. Tell students you are going to do a study in gasoline use by cars belonging to families, relatives, or friends in your classroom. Then put two phrases on the blackboard. The first phrase should be "number of miles". The second phrase should be "total cost". Now have each student report to you how many miles their family, relatives or friends drove their car. These should be put together in a list that can be added by you or by the students for a total. Put the total under the phrase "number of miles". Students should see that the class as a whole used the cars a lot more than any one student.

Now tell students that gasoline is used up according to how many miles are driven. Tell them gasoline costs a lot of money. Now calculate the cost of gasoline used by the students according to the previous formula. Write the total on the board under the phrase "total cost". Students should be amazed. Now conduct a class discussion using the following questions.

1. How many miles did the class as a whole use the car?
2. What was the total cost of the gasoline energy that was used by the class?
3. What would happen if we drove many fewer miles in cars? (You might suggest half the amount under the phrase "number of miles" or 100 less miles, etc.) (Answer: the cost would be much less and we would save energy.) You might want to calculate the savings by subtracting the number of saved miles in number one and follow the formula.
4. In what ways might we save on the gasoline energy that we use? (i.e. Walk instead of ride; use the car together instead of individually.)

G. Ask students who else uses gasoline in their community (i.e. people who drive buses or trucks, motorcyclists, boaters, farmers on tractors). Go back to your map and help students to identify the major places in which gasoline energy is used (highways, farms). Have someone who drives a lot (i.e. the school bus driver) come in and talk with students about how important gasoline is to his or her job. Focus on ways that gasoline is used, ways it might be saved, and what would happen if there were no gasoline.

H. Summarize what the students have done in terms of community energy. Ask them what they know about the largest energy consumers in their community. They should quickly tell you that cars and homes are major energy consumers. Then have students think about ways that they might save energy. Have them try out one of these ways for one week as part of a class project. Ask students during that week how they are making progress and why they think that saving energy is important.

Grade Level Adaptation

K-1: Use the pictures in the lesson to indicate to students where energy is used and who uses energy in their community. Use examples of your own car or your own house to help students to see how important cars and homes are in energy use in communities. Discuss with students how they think they could save on energy use. List their responses on the board.

4-6: Have students gather articles on places in their community that use energy. They can do a lengthy study of their own family cars and homes in terms of energy consumption. You many want someone from a public utility to come in to talk to the students.

Language Arts Adaptation

K-1: Have students act out how they would use energy in the places shown in the pictures with this lesson.

2-3: Have students pick out examples of energy use in the community from a book they are reading.

4-6: Have students write a story about the energy use of a particular person, group, or building in their community.

Math Adaptation

K-1: Have students compare the energy use of two people that you tell them about. Make these people drive cars differently and use heat differently in their home. They should be able to tell which of the two people uses more or less energy.

2-3: You may want students to add all the types of places and people who use energy that are represented in the pictures with this lesson.

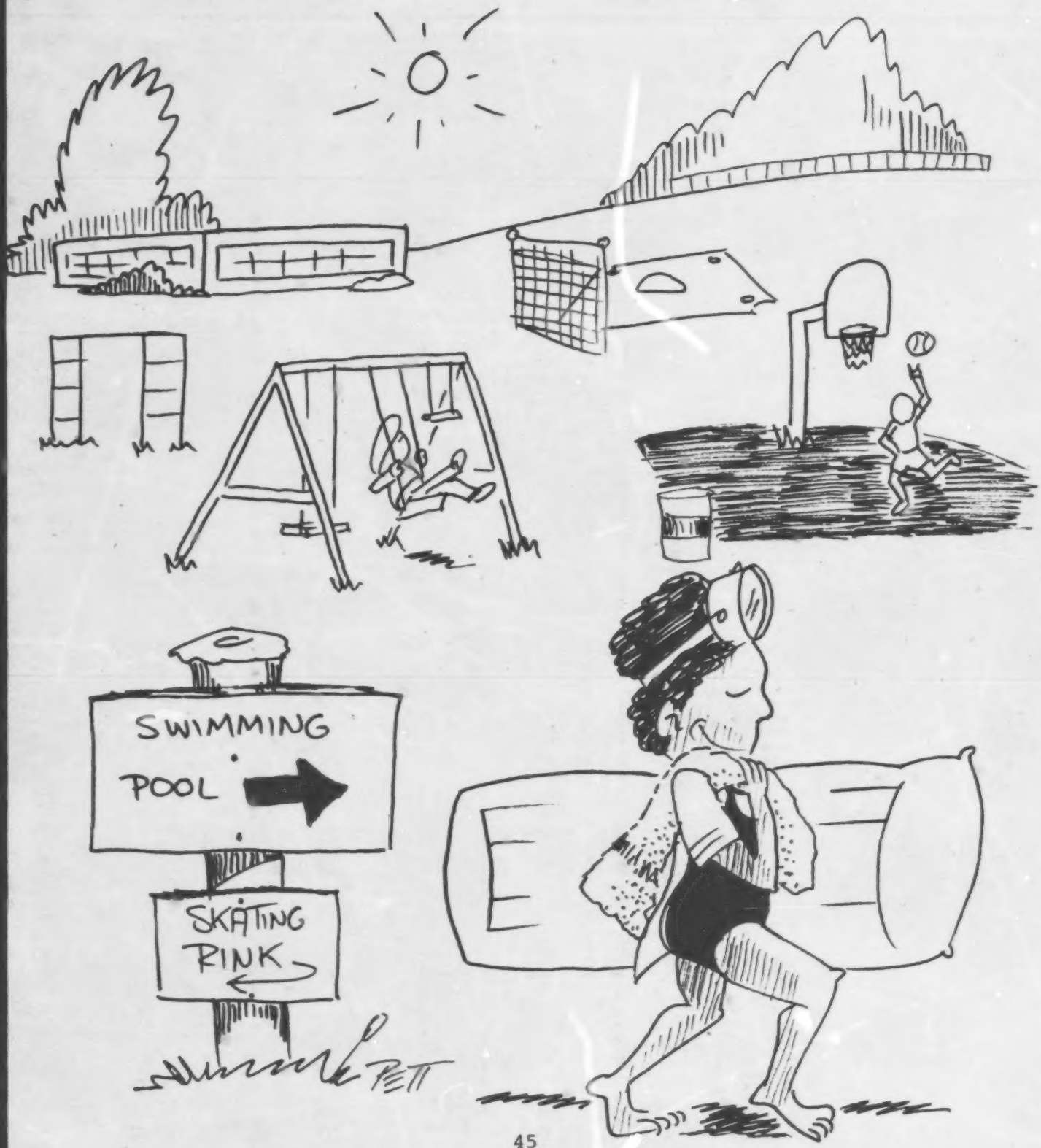
4-6: Have students work more with gasoline and mileage to teach them any basic math functions that you are now using in the classroom.

55

56

LESSON 1-1: PICTURE 1-1

LESSON 1-1: PICTURE 1-2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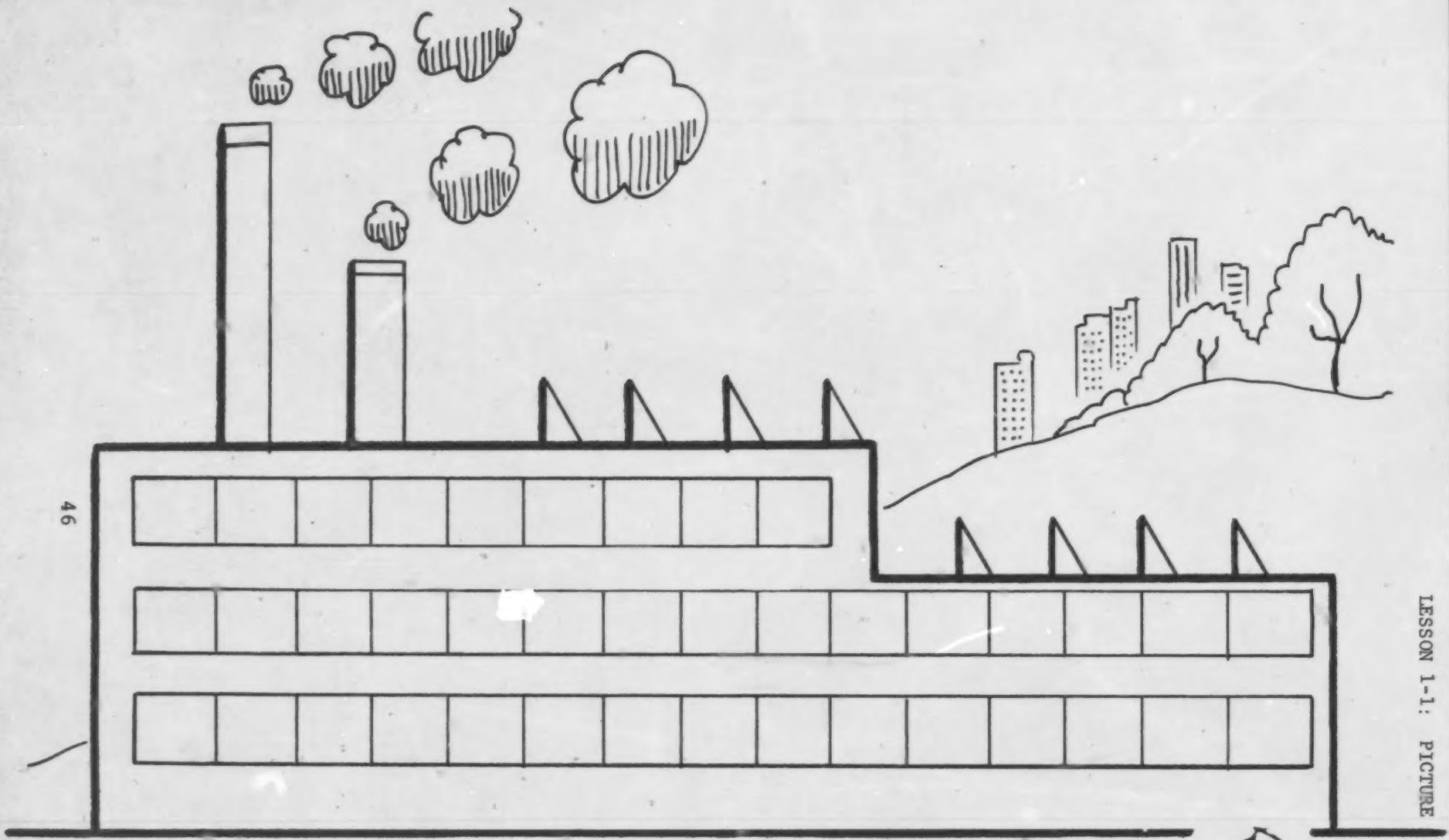

PETT

COUNTY
COURTHOUSE

LESSON 1-4: PEOPLE WHO HELP OTHERS

Rationale

Students have learned about how their neighborhood, businesses and factories use energy in their community. Here they will learn how people who serve others also use energy. They will learn about how people who belong to the police force, the fire department, hospitals, and youth organizations also use energy.

The lesson will focus on people in service groups in the community. It will also acquaint students with the skill of gathering evidence. It is important for them to know how to get information about energy use if they are going to be effective energy actors themselves. They certainly need to be able to back up what they say when they talk about saving energy. This lesson is designed to introduce this skill in the context of learning about community service organizations that use energy.

Objectives

1. Students will know how various service organizations in their community use energy. Assessment of this objective can be obtained by students' responses to the summary discussion in Activity H of this lesson or by Assessment Activity 1-4 at the end of this chapter.

2. Students will learn the skill of gathering evidence. Assessment of this skill can be tested by students' presentations of their study of one service organization in Activity I of this lesson.

Main Activity

A. Explain to students that there are people in their community that serve others. They try to help others out. Often, there are organizations that are designed to help people to lead better lives. Ask students if they can think of any service organizations in their community. You may start the discussion by giving them some suggestions, such as the way their hospitals help people who are sick. Take the students' suggestions and write them on the board underneath the title, "People who help others."

B. Use Pictures 4-1 through 4-3 to help students explore the idea of community service organizations and their use of energy. The idea here is for students to see who is represented in the picture, how these people help others, and how these people use energy every day.

Picture 4-1: Fire and Police. The fireman and policeman in this picture help the community by putting out fires and by enforcing the law. Without them, community life would be very disorganized. They also use energy in various ways. Fireman certainly use water to put out fires, as policemen use cars in order to patrol roads.

Picture 4-2: Youth Organizations. The Cub Scouts and Brownie Scouts are youth organizations where students get together and carry out a variety of activities. They often help the community. For example, they have clean-up campaigns or recycling campaigns where students try to practice energy conservation. In cities, the YMCA and YWCA serve much the same function in almost any community. Youth service organizations help youth to do constructive activities which better community life. All of these activities use energy in some way.

Picture 4-3: Hospitals and Clinics. Hospitals and clinics are an important part of the community. They help people who are sick get well. They use heat and light. They also use gasoline for ambulances.

C. Have students color the pictures of various aspects of the community where service is done. Have them draw in any uses of energy that they can think of which are not represented in the pictures.

or

Have students gather their own pictures or draw pictures of service organizations that are using energy from their local newspaper, from their home, or from organizations with which they are affiliated. Have them describe the pictures in class in terms of what the organization is, what it does for the community, and how it uses energy.

D. Select one of the above groups -- hospitals or youth groups or the police or fire department -- and review with students the ways in which these groups use energy. Talk with students about how when you need information about energy, you need to find that information. In order to find information you need to use sources. Sources of information can be people, books, magazines, or the television, or lots of other sources. In terms of the group you have chosen, ask students to use one source in order to help them find out more about energy use for this group.

E. You should gather information sources representing a variety of types of sources in class. Students should bring their sources to class and report on what sources they use. You should conduct a class discussion of the energy use of a particular group and the source students have found, based on the following questions:

1. What do you know now that you did not know about energy use by this group?

2. What else would you like to know about energy use by this group?

3. What questions might you ask someone who would come into the class about energy use by their group?

F. Bring in someone from the group that students have investigated to talk about energy use by this group. Have students ask that person their questions, and use that person as a source for information. Remind students that people can be very valuable sources for finding out about energy use.

G. Then ask students to talk with their parents about a particular community service group and the way it uses energy. Tell them to use their parents as a source for information and to come back to class to talk about what their parents say. In class, discuss with students how much more information they have about energy use as a result of using their parents as a source of information.

H. Summarize what students have learned about service organizations. In addition to organizations in the pictures, be sure to include day care centers, garbage services, etc. Help students to make a list of community service groups on the board. Have students name the organization, list how the organization helps the community, and how that organization uses energy. Then talk with students about why we need community service organizations and the various ways in which they can be sources of information about energy use.

I. Have students find out about one service organization to which they belong or someone in their family belongs. Have them list the sources they use to find out about this organization. Have them make a short oral talk about what the organization does, how it uses energy, and what sources of information they used to find out about that organization.

Grade Level Adaptation

K-1: You may want to use different pictures with this lesson. There should be pictures of service occupations in a book that students have in the classroom. You may also want to bring in a set of sources of information, and bring in persons who can relate to K-1 students how they use energy in their service occupations (i.e. safety patrol, school nurse, etc.)

4-6: Students can bring in their own pictures or news articles about service organizations that are using energy. They can do group projects to find out about what these groups do, how they use energy, and how they might save energy. Students can do interviews, use primary sources, and secondary sources in the library.

Language Arts Adaptation

K-1: Have students use a tape recorder and describe a person or a service organization with which they are familiar and the energy that this organization uses.

2-3: Have students find one source of information about energy use. Have them give the name of this source and state why it has helped them to find out more information about energy use.

4-6: Have students use the library to write a report on one service organization.

Math Adaptation

K-1: Have students count the number of service organizations they see on their way to school. Have them count them on the way home. See if they can find more organizations on their way home than they did on their way to school. Gather a variety of pictures of community service organizations which students can sort into groups representing fire and police, youth organizations and hospitals.

2-3: Have students study newspaper headlines in their local paper to see how many of the headlines deal with service organizations. Have them describe how these service organizations use energy.

4-6: Have students use a telephone book to list the number of service organizations that are in their community. Have them add or subtract, multiply or divide the number of service agencies, depending upon what math functions you are teaching.

POLICE
PETT

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HOSPITAL
EMERGENCIES
AMBULANCE
AMBULANCE

LESSON 2-4: WASTING ENERGY

Rationale

Students have learned in the previous lesson about saving energy. In this lesson, students will apply their knowledge about wasting energy to their own everyday lives and their community. They will speculate about the largest energy wasters, and study a cartoon strip which will show them examples of energy waste. They will apply their Energy Waster Index to their own lives, and gather evidence about energy waste in their community. They will also make plans for energy conservation in the areas of waste that they have identified.

The purpose here is to link students' knowledge to their everyday lives by teaching them ways energy is wasted and how they can participate in energy conservation. This link between knowledge and action is important if students are to use their knowledge in useful ways in the energy area.

Objectives

1. Students will set energy conservation as a high priority in their everyday lives. Assessment of this objective can be made by students' responses to Part G and Part H of this lesson.

2. Students will apply their knowledge of energy waste to their own everyday lives. Assessment of this objective can be made by students' recommendations to reduce waste in Parts H and I of this lesson.

Main Activity

A. Ask students to think about things they waste every day. They may waste food by not eating it and throwing it away. They may waste paper or crayons by only using a little bit and then throwing them away. Put the word "waste" on the board. List students' examples under it. They should see that waste is part of their everyday lives, and involves poor use of things. Ask them to compare the ways they waste things to the ways they have listed to save things.

B. Talk with students about how they also waste energy. Use the list you have written on the board to talk with students about how some of their examples involve wasting energy (i.e. food energy, paper energy). Some items that students suggest that involve energy waste.

C. Help students to more fully see one way that they waste energy -- they throw away things they could use, or others could use again. Explain to students that food can be saved, as can crayons.

Other items can be recycled. Used paper can be reused if it is collected, processed, and made into new paper. The same is true for cans and bottles. Ask students to bring in one item from home that could be recycled. You should bring comparable recycled products to class for discussion.

When students bring their items to class, talk with them about how they waste these items, and how they can be recycled. You may want to have someone from a recycling center come to class to talk about what is recycled, how it is done, and how important it is to their community.

D. Ask students to draw pictures or act out ways they waste an energy product and how it can be saved or recycled.

E. Now read, or ask students to read aloud, the cartoon strip on "Willy, the Waster," The cartoon strip indicates how people waste energy in all of their consumer roles. Review with students the three roles of shopper, user, and disposer of energy. Tell them that there are instances in the cartoon strip in which energy is wasted in each of these roles. Have them speculate about how energy is wasted, and then have them answer the following questions:

1. In what ways did Willy waste energy as a shopper? (i.e. He chose George the Can without thinking about the energy he was using in the can or its contents.

2. How did Willy use energy wastefully? (i.e. He did not drink all of the contents.)

3. How did Willy dispose of energy wastefully? (i.e. He did not throw away the can in a place where it could be reused or recycled, or one that was safe.)

F. Students should then study the Energy Waster Questions, a way to tell whether or not energy is being wasted. The index is divided into three parts, including shopper, user, and disposer roles. The list should include a set of questions which pinpoint energy waste. The two questions under each category below indicate possible Energy Waster Questions that students could use.

ENERGY WASTER QUESTIONS

Shopper

1. Do I really need this product?
2. Is it best to use this product or another product?

User

1. When do I need to use this energy?
2. How much energy do I need to use?

Disposer

1. Do I need to throw this away, or can I use it again?
2. Can this be recycled?

Discuss the Energy Waster Questions with students. See if they think they cover all of the dimensions of possible energy waste for them, and for their community. Add or substitute questions developed by students.

G. Students should then give themselves a self-check in class, as small groups, or as individuals on the Energy Waster Questions. They should take a product, such as electricity, cars, home heating or school lighting, and determine answers to the questions on the index. Do they really need to use lights? Is it best to use the lights all the time? They should continue with these questions and determine whether or not there is wastage in the areas of shopping, using or disposing of energy for the product they have selected.

H. Now ask students to select one form of energy they think they use a lot. (i.e. food, family car gasoline) They should get information (self-reports, observation, a log) about their use of this form of energy. They should then determine answers to the questions in their Energy Waster Questions. Have them bring their information and answers to class.

When students have finished collecting their answers, discuss them in class using the following questions:

1. What energy did you waste?
2. How did you waste that energy? (i.e. shopping, using, disposing)
3. How can you try to save energy? (i.e. recycling, using again, using less, using less often)
4. Why is saving this energy important? (i.e. saves money, saves energy for everyone)

I. Ask students to try to be more careful of energy based on their answers to Question #3 above for one week. Talk with them about their progress in saving this energy as they try to carry out their ideas.

Grade Level Adaptation

K-1: Teach the idea of "waste". Then identify one or two things students waste in their homes or classroom. Suggest ways they might try not to waste it.

4-6: You may want students to visit a recycling center. They can also keep logs of their plans to avoid wasting energy.

Language Arts Adaptation

K-1: Have students use puppets to talk about a specific energy product they waste and how it could be saved.

2-3: Have students devise some additional questions for the Energy Waster Questions. Or you may want them to use certain words or to develop sentences according to what you are teaching in language arts.

4-6: Have students report on changes that have been made as a result of their trying not to waste energy. They may write reports on these changes depending upon what language arts skills you are currently teaching.

Math Adaptation

K-1: Ask students whether they are using less energy as a result of learning about waste. Ask them to describe how they are using less.

2-3: Help students to quantify how much energy they are saving as a result of Activity I, using math functions you are currently teaching.

4-6: Have students do a graph or a chart of their own energy wasting. They can use statistics from their school, their home, or community life in order to draw the graph or the chart.

ENERGY WASTER QUESTIONS

Shopper

1. Do I really need to use this product?
2. Is it best to use this product or another product?
3. _____?

User

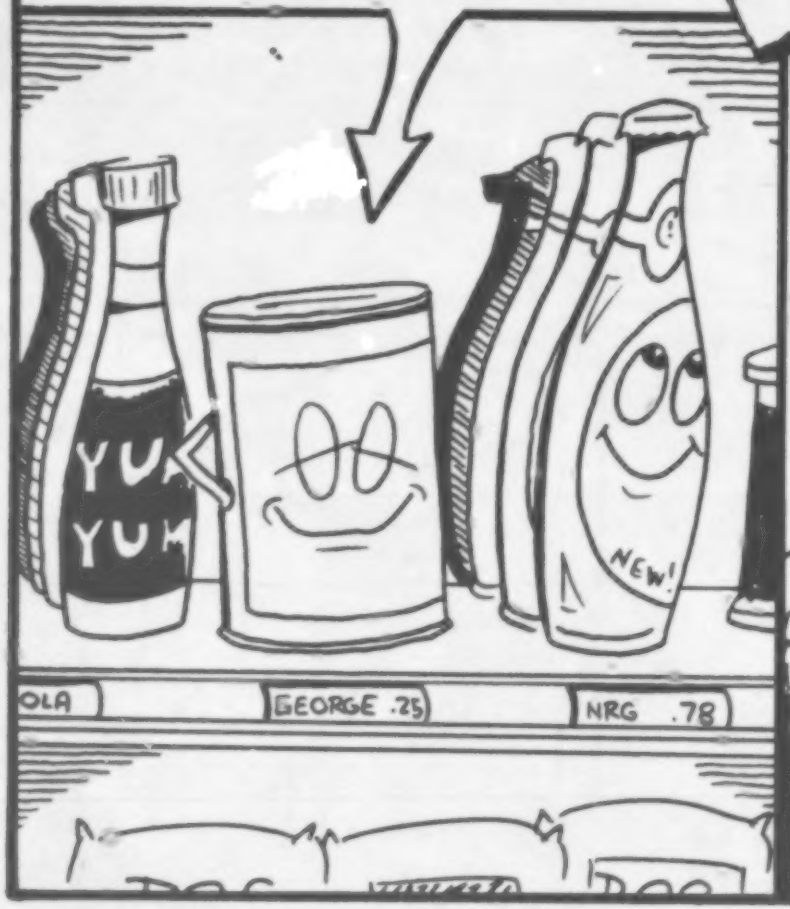
1. When do I need to use this energy?
2. How much energy do I need to use?
3. _____?

Disposer

1. Do I need to throw this away, or can I use it again?
2. Can this be recycled?
3. _____?

PRESENTING...
WILLIE
THE WASTER
IN....
WHO CARES?
BY PETT
STARRING...
WILLIE
AND...
GEORGE THE CAN

GEORGE THE CAN WAS VERY HAPPY. HE LIVED ON A SHELF, WAITING FOR SOMEONE TO BUY HIM AND TAKE HIM HOME.



78

THEN *WILLIE THE WASTER* CAME OVER WITH HIS AUNT, SAYING...

79

SO GEORGE JOINED WILLIE'S GROCERIES- HE HAD NO CHOICE!!

GEORGE WAS OPENED AS SOON AS WILLIE LEFT THE STORE —— BUT IMAGINE HIS DISMAY WHEN WILLIE THREW HIS TOP IN THE GUTTER!!

!

WHO CARES?

GEORGE WAS NOT HAPPY!

BUT THE WORST WAS YET TO COME! WILLIE DIDN'T EVEN FINISH GEORGE'S CONTENTS BEFORE HE TOSSED HIM OUT THE CAR WINDOW!!

NOW I'LL PROBABLY NEVER GET RECYCLED AGAIN!!

WILLIE!

AH WHO CARES?

WHAT A WASTE!!

WILLIE DIDN'T SHOP TOO WISELY THEN HE WASTED GEORGE'S JUICE AND NOW HE'S DISPOSED OF GEORGE IN THE STREET! WILLIE WASTES ENERGY!

THE END

LESSON 2-4: PICTURE 1-3

LESSON 3-2: PEOPLE'S ENERGY HABITS

Rationale

This lesson is designed to show students good and bad habits of energy use. Students will see how they can change bad habits to good habits and practice some ways of changing their own energy habits as well as those of others.

The skill of changing habits is taught here. It is one of the most important participation skills involved in being an effective energy actor. If we cannot effectively change our habits, our knowledge will do us very little good.

Objectives

1. Students will become aware of their own good and bad habits as energy consumers. Assessment of this objective can be done by analyzing student responses to Activities A and B.

2. Students will learn how they can act to change their energy habits. Assessment of this objective can be done by student responses to questions in Activity D or by Assessment Activity 3-2 at the end of this chapter.

Main Activity

A. Students have seen how they perform consumer roles in the energy situation and have seen how people can waste or conserve energy. They have also made a list of the "good habits" they might develop as energy users in the previous lesson. Students should review the essential aspects of their roles as energy consumers and talk about how their good habits fit into the categories of shopper, user, and disposer of energy.

B. Begin the new information in the lesson by having students develop a list of the five or ten worst energy habits that they can think of. This will be the "bad habit" list. Students should reflect on their own lives and what bad energy habits they have and the people around them have. This list should be put up next to the list of good habits that they have made in the previous lesson.

C. Now that students have listed their good and bad energy habits, the question is how we can change bad habits to make them good habits. Point out to students that changing a habit is not an easy thing to do. Have them take one of their bad habits, and talk about how hard it would be to change it. Perhaps they do not clean up their room, or they do not get along with their sisters or brothers, or they eat junk food all the time. These types of habits can be changed, but it is difficult.

D. Work with students in developing four types of ways that bad energy habits can be changed into good energy habits. The pictures and/or the cases enclosed with this lesson can be used to illustrate four ways that habits can be changed. They are: reward, punishment, convincing someone, leading someone.

If you use Pictures 2-1 through 2-4, talk with students about each of these four methods of changing bad habits to good habits. Have them draw examples from the lists they have of bad and good energy habits. The pictures illustrate the following.

2-1: Shows a girl being rewarded for changing a bad habit, turning off lights.

2-2: Shows a boy being punished in order to change a habit, not closing the door.

2-3: Shows a father convincing his son to change a habit, wearing a sweater so the heat can be turned down.

2-4: Shows a mother leading her son to change his habit by riding his bike instead of using the family car.

If you use the cases that are enclosed with this lesson, you might divide the students into groups to read the cases, have them read aloud in class, or have students read them individually. Then guide a discussion asking the following questions.

1. What method of changing bad to good habits is illustrated here? (i.e. reward)

2. Why is it difficult to change bad to good habits in this case? (i.e. people like the old ones)

3. What happens if we change bad to good energy habits? (i.e. we are happier, we save energy)

E. Discuss with students the possible impact it can have if bad habits are changed to good habits by individuals on the energy problem. Talk with students about how changing habits helps to change entire patterns of energy use. Therefore, for example, if everyone changed a bad habit of not turning off the lights to a good habit of turning them off, the following types of impact could be felt: 1) Everyone could save money which they could use for other things; 2) Everyone could help the local, state, and national situation, and therefore there would be more energy for those who need it; 3) Everyone would be happier because the world would be a better place to live, and there would be less tension and conflict over energy resources; 4) People would be taking leadership in something which was important to everyone.

F. Have the students divide into pairs. Have them talk about one habit that they themselves can change from a bad habit to a good habit. Have each pair of students list a bad habit and then try to change it. They should work with another student who will monitor their progress and help them to change it.

G. Have the students report back to class either orally or in written essays about their changes in their energy habits. Have them talk about the impact that this can have on the energy situation.

Grade Level Adaptation

K-1: Use the pictures and have students use one method for changing habits where you or their parents can help them.

4-6: Have students read the stories. Ask them to practice and to do a report on each of the four ways they practice changing their habits.

Language Arts Adaptation

K-1: Have students act out the ways of changing habits.

2-3: Have students make a larger list of good and bad habits. You may want to teach them to spell the words and have a kind of spelling bee where students spell a word that is a good or bad habit and give an example of it.

4-6: Have students write a dialogue or an essay on one way they changed a habit from bad to good, or could change a habit from a bad one to a good one, or had trouble changing a habit.

Math Adaptation

K-1: Ask students to compare who in the pictures is wasting more or less energy.

2-3: Have students count the habits on the list they have made. Also, they may want to work with the clock in counting the number of hours, minutes or days in which they practice the habit.

4-6: Have students do graphs of different good and bad habits in groups of individuals. You may want to do a survey of the class and have them work with the data, depending on what particular math function you are teaching at this time.

SALLY'S REWARD

Sally is a third-grader in Center City. She is active in a lot of sports with her friends. She is so active that she has a hard time getting enough sleep. She often cannot get up in time to catch her bus. Her mother and father drive Sally to school.

Sally also really likes to go out to dinner. She often does that with her parents. She enjoys having a meal out with them.

Sally's mother and father were tired of taking her to school. They had an idea. They told Sally that, if she would get up in time to walk to school every morning for a week, they would go out to dinner on Friday.

Sally thought it was a good idea to go out to dinner. She liked that. Getting up was a hard thing to do. Sally's mother bought an alarm clock. Sally started to get up early. The first few mornings it was very hard, but she started thinking about the dinner her family would have Friday.

After a week of walking to school, Sally began to like it. She walked with her friends. She had more time to talk with them before school started. She also went out to dinner with the family and she enjoyed it.

SAM'S PUNISHMENT

Sam was a fourth-grader in Newton. He liked television. As soon as Sam came home from school, he always turned on the television. He watched it until dinner. Then he watched it until bedtime.

The only thing that Sam did other than watch television was play ball. He really loved going to practice with the other boys in his third-grade class.

Sam's parents did not want him to watch television. They knew the television used a lot of energy. They asked Sam to watch less television. But Sam could not. He had watched television for too long.

One day Sam's parents said that he should only watch two hours of television each day. If he did not, they would not let him go to the ball practice.

Sam was unhappy. He wanted to play ball. He missed two games. He started watching less television. He found that he had many other things to do. He enjoyed playing ball. He liked riding bikes with his friends. Now, Sam does not watch television. He plays ball with his friends.

SUSIE'S PAPER PLAN

Susie was a first-grader in Davis City. Her parents were worried about the energy problem. Susie worried too. They always put their newspapers in a stack. Then they took them to a place where they could be used again to make new paper. This way, not so many trees were cut. Wood, a valuable resource, was saved.

Susie did not see any reason why they could not recycle paper that they used at school. They used a lot of paper to do lessons, art work, and other things. All they would need to do would be to put it in a pile, and get students to recycle it by using the other side.

Susie talked with her teacher. The teacher thought it was a good idea. They then talked to the class. The class also thought it was a good idea. The first-grade class stacked all of their waste paper into one place. When they needed to draw a picture they took out a piece of paper and used the other side.

They saved energy. Other classes began to do the same thing.

JIMMY'S LEADERSHIP

Jimmy was a third-grader at Sydney. He was concerned about the plastic products that were used in the community. Plastic products were made from oil. He did not know how to go about getting people to use other types of containers than plastic ones.

Jimmy talked with his father. His father said that he might form a group of people in the community who would go door-to-door and talk about the problem of plastics. Jimmy thought that he could try to get people to use paper milk cartons rather than plastic bottles.

Jimmy organized a group of students in the third-grade class. They decided to choose one neighborhood in order to go door-to-door and talk with people about plastic milk bottles. They thought about what they would say. They would also try to get the local newspaper to do a story about their project. The newspaper article helped a lot of people to find out about plastic milk bottles. Jimmy's leadership went beyond his own local block. Soon the whole community was more conscious of the use of plastic products.

89

NO
TV!

LESSON 3-2: PICTURE 2-3

73

LESSON 3-2: PICTURE 2-4

74

UNIT III: ENERGY IN ACTION

Unit III contains three chapters. Each chapter contains six lessons. The lessons in this sampler represent four lessons from this unit.

The objective of the unit is to integrate together awareness, knowledge, skills, and participation experiences in order for students to become more effective energy actors. They are made aware of how energy is a dynamic idea, and of the process of energy use as it relates to their everyday lives. They are given knowledge about how human energy is transformed from source to a product and its use. They learn basic skills of dealing with values as they enter into decisions about actions in the energy area. Finally, they participate in a group or class project related to energy conservation in their school, homes, or community. The linkage between these objectives is as important as the individual objectives themselves. They are designed to integrate together to help make students more effective energy actors.

Chapter 1 is titled Energy Coming and Going. It begins to teach students about the process of energy transformation and use. The first lesson from that chapter is included in this sampler. It is designed to promote awareness of energy dynamics.

Chapter 2 focuses on solving energy problems. It introduces students to the actors, issues, and skills necessary to take effective action on energy issues. The first lesson in the sampler included from this chapter teaches students about a wide range of actors that are involved in energy problem-solving. The second lesson focuses on the classroom group project which students will undertake. Actually, they will plan this project throughout this entire chapter, and the lesson included here is the culmination of class activity.

Chapter 3 focuses on the outcomes of energy use and energy in the future. It is here where basic value questions are paramount. The lesson which is included from this chapter explores students' basic values about energy issues, and how they can use them in decision-making about energy.

These lessons can be used individually, as they are presented here. They are designed to be used for grades 4-6 in sequence, with adaptations for other grade levels and language arts and math subjects. In the entire set of curriculum materials, the lessons are matched with assessment activities for each major objective.

LESSON 1-1: ENERGY COMING AND GOING

Rationale

It is important to know about products made from energy. It is equally important to know where energy products come from and where they go, or how they are used. The process in itself is important. Those who wish to save energy can do so by understanding important ways that energy is processed.

This lesson focuses on awareness of how energy is processed or transformed. It also teaches an important concept, that of transformation. This concept will help students add to their knowledge about energy and apply knowledge to their everyday lives.

Objectives

1. Students will be aware of the myriad of ways that energy comes to us and how it is used. Assessment of this objective can be obtained by studying students' responses to the summary discussion in Activity H.

2. Students will know the concept of energy transformation. This objective can be assessed by students' responses to Activity D in this lesson, or Assessment Activity 1-1 at the end of this chapter.

Main Activity

A. Begin this lesson by helping students to think about something that is actually transformed from a raw resource into a product and then used. They need not learn these terms at this time. You might want to discuss with students the making of something like oatmeal cookies. Normally people make cookies from ingredients, such as oatmeal, flour, and eggs. They use a recipe which tell them what to do in order to combine those ingredients (or process them) in a way that they become a product, the oatmeal cookie.

Oatmeal Cookies (Moist)

1 1/2 cups brown sugar (or part honey)
1/2 cup shortening
1 1/2 cups oatmeal
2 eggs
1 tsp. soda dissolved in 1/4 cup hot water
1 1/2 cups whole wheat or white flour
1/2 tsp. salt
1/2 tsp. cinnamon
1 cup raisins boiled in a small amount of water

Mix shortening, sugar, and eggs thoroughly.
Add oats, dry ingredients, and soda. Add raisins.
Drop by teaspoonfuls on cookie sheet. Bake at 350°
for 15 minutes.
Makes approximately two and one-half dozen.

Talk with students about the oatmeal cookie example. Ask students the following questions.

1. What ingredients are used in making oatmeal cookies? Where are these ingredients normally found? (Ingredients are oatmeal, brown sugar, flour, raisins, eggs, etc. They are normally found in the grocery store, or in the kitchen of someone's home.)

2. How are cookies made out of these ingredients? (The ingredients are combined and beaten; the cookies are then baked in the oven.)

3. What product is made as a result? (The product in this case is the oatmeal cookie.)

4. How is the product used? (We normally eat it, either quickly or over a longer period of time. We use it for energy to play, learn, etc.)

B. Tell students that the process of using energy is much like the process of making oatmeal cookies. There are ingredients, or sources of energy. We work with those sources in order to make an energy product, such as lighting or heating. We then use that product in various ways. Ask students to list what energy ingredients or sources they are familiar with. The list should include coal, oil, water, wind, solar energy, and others that students can think of. Make the list as comprehensive as necessary to meet the needs of the students. We merely want students to be aware of vast arrays of energy sources which are available to be processed into an energy product.

C. Ask students to find a set of pictures in magazines, newspapers, and other places, which show energy sources. When students have selected their pictures, discuss with students in class and identify sources on their list that correspond with the pictures.

D. Now ask students to look again at their list and ask them how these sources are processed in order to make the energy products that they see around them every day. Talk with students about how coal, for example, is found in the ground. It is mined, and then transported via trucks or rail to processing plants which transform coal into electrical energy or use it for heating purposes. Again, it is not important for students to know the exact process at this point, but to select a few energy sources from their list and to know that a process does exist which involves the transformation of the source into the energy product that they see in their home, community, or school.

E. Ask someone (such as a parent involved in energy production) to come into the classroom and talk about an energy product that the students are interested in. Have that person describe, for example, how coal or oil is processed, and how it is used in their community.

or

Have students do a survey of their classroom, school, or homes. Have them determine one of the energy products in these places, and have them study how this product came into their homes or school or classroom.

F. Now talk with students about how the processing or transformation of energy results in an energy product. Energy products are all around us, from the pens and pencils we use to write with and the paper we write on, to the lights we use to see by. Have students do another list of energy products that they use every day and that are commonly used by people in the United States. Then talk with them about their original list of sources and their list of products, using the following questions.

1. What sources are the base for the product that you have listed?

2. How generally are these sources transformed into products?

3. Why is it important to have these energy products?

G. Now talk with students about how energy products are used. Oil, for example, is used for cars, home heating, and other activities. Make a list with students of the major ways in which the products which they have listed are used in their school, homes, and/or community.

H. Put the word "transformation" on the board. Ask students to summarize the ways energy is transformed, and tell them that transformation consists of four parts. The first is the sources, or ingredients, that are used. The second is the process of transformation. The third is the product that is produced. The fourth is the use that is made of that product. Have students take several of the energy sources that they listed in the beginning and trace the process of transformation. You should see that students understand the concept of transformation and how important it is to understanding energy and energy use.

Grade Level Adaptation

K-1: Have students use cookies and many other examples of how something is transformed from one form to another. Then take one form of energy with which you are familiar and talk with students about that process of transformation.

2-3: Gather pictures of several energy sources, and do the lesson in terms of those pictures you have gathered.

Language Arts Adaptation

K-1: Have students do something, like make oatmeal cookies, to see how the transformation process is done. Otherwise, you might have them act out the making of cookies or some other activity which requires the transformation of a source into a product.

2-3: Have students read stories in available books they are reading about the transformation of a source into a product.

4-6: Have students write a play about one energy source, how it is transformed into a product, and how they use it every day.

Math Adaptation

K-1: Have students look at the list they have made of ingredients, or sources of products. Ask them which sources they can do more things with, and which they can do fewer things with.

2-3: Have students use the list they have made to practice adding, subtracting, multiplying, or dividing various energy sources, products, and uses.

4-6: Have students study the concept of transformation by relating their work in this lesson to any math function that you are teaching. Basically, math functions are also transformations. Students might study one energy source in terms of a math function, such as what is added in the transformation process, what is subtracted, what is multiplied, or what is divided.

LESSON 2-2: ENERGY ACTORS

Rationale

Students have identified some major energy problems in previous lessons. Here, they will learn about the wide range of actors that become involved in problem-solving on energy issues. They will learn about these actors and apply their knowledge to their own roles as effective energy actors and their own energy projects. They will identify the major energy actors involved in the question they are studying, as well as how they can act in productive ways in relation to these actors.

Objectives

1. Students will become aware of themselves as important energy actors, and of a wide range of people who are involved in energy issues. Assessment of this activity can be determined by students' responses to Activity F in this lesson.

2. Students will know the major energy actors involved in energy issues, and will apply their knowledge to their own study of energy issues. Assessment of this knowledge can be made by students' responses to Activity C in this lesson and to Assessment Activity 2-2 at the end of this chapter.

Main Activity

A. Talk with students about how energy actors are not unlike actors in a play that they have read, a story that they have just read, or a TV program that they have watched. Actors are people who take a part, who try to take actions in a situation. Review with students the major actors in a play, story, or program that you select, and how they take part and work with other actors. For example, if students have been watching a particular television program, have them identify the lead actor and/or actress. Have them show how these people interact with others in the story in ways such as making a decision about what to do, or taking a particular action.

B. Talk with students about how actors can also be energy actors. In effect, the energy problem presents the setting for the play and people take part by playing various roles and acting together. Use Dialogue 2-1: "Rhoda's Choice" to have students see the actors, the parts they play, and other actions that might be involved in Rhoda's choice. Ask them to read "Rhoda's Choice" to themselves or aloud or have them role play the dialogue completing the conversation between Rhoda and Annie using their own idea about saving energy. Help them answer the following questions.

1. Who are the actors in this case? (Rhoda and Annie)

2. What part did the actors play in their discussion about energy? (Rhoda asked to turn out the lights; Annie asked her questions.)

3. What other actors might be important to include in this dialogue? (i.e. Rhoda's parents might have come in.)

C. There are a wide variety of major actors involved in any energy situation. The three stories which are enclosed with this lesson indicate how some of the major actors are involved in the energy problem. Majors actors include government, business, citizens, utilities, producers of energy, and people who transport energy. Have students read the three cases silently, aloud, in small groups, or as a class, and then conduct a class discussion using the following questions.

1. Who were the major actors in these cases? (i.e. Pete)

2. What part did they play in the energy problem that is posed? (i.e. they tried to save energy, they wrote their Congressperson)

3. How might citizens influence actors on an energy question? (i.e. talk with them, write them)

4. Which group would be likely to have the greatest effect on energy savings in the community?

D. Bring in someone to the class who is an actor on an energy question from government, business, a utility company, a producer, or a person involved in transportation. You might also want to bring in a person who is a citizen who is now active in the energy area. Have that person discuss with students the way they act on energy issues, why they act as they do, and how they make decisions.

or

Have students study one energy actor and write a description of that actor and how the person plays a part in an energy issue.

E. Talk with students about how they also are actors in the energy area. They are first actors as citizens. They ride in cars and consume energy by lighting and heating their homes. They are also potential future actors in businesses, government, utility companies, transportation, industries, and other areas. Therefore, the things they learn about actors now will help them to see what kinds of energy decisions they will need to make when they enter these types of occupations. Talk with students about how they are actors now, what kinds of energy actors they might be in the future, and how they would act differently in a job in government or business, for example, as a result of learning about the energy problem.

Work with students in designing a play about energy actors. Have them present the play to a lower grade class. Ask them to design questions which they can use to guide a discussion with these students after the play.

F. Then have students identify the actors that are involved in the class or group project which they are undertaking. They should identify actors in government, business, utilities, producers, of energy, or energy transportation which impact on their energy problem. They should also talk about how they are energy actors, and how they have an impact upon the problem they are seeking to study. This identification of actors will help them in their own study of the energy problem. Make a list of the actors they identify on the board, and make a list of ways they identify for taking their own action in regard to their energy problem. Then help students summarize the importance of actors in any energy issue.

Grade Level Adaptation

K-1: You may want to read the dialogue to the students. Have a person who is an energy actor, or several people, come to your classroom to talk about how they act in the energy area.

2-3: Have students collect pictures of the major kinds of energy actors. You may also want someone to come in and visit the class who is from one of these occupations.

Language Arts Adaptation

K-1: Have students work with puppets to talk about how different energy actors use and save energy using the stories as a basis.

2-3: Have students as a class compose stories from the four cases. Have them write a short description of one energy actor

4-6: Have students write a song focusing on one energy actor and how he or she contributes to energy issues.

Math Adaptation

K-1: Have students collect pictures of energy users and sort them according to the amount of energy used by each picture.

2-3: Have students collect data using a simple math idea that you are teaching on the use of energy by any of the actors outlined in this lesson.

4-6: Have students collect data on average wattage of outdoor signs. If each store has three outdoor signs and there were 100 stores in Mary's city (see story 2-2) how much power was saved?

DIALOGUE 2-1: RHODA'S CHOICE

The scene for the play is Rhoda's house. Rhoda and her friend, Annie, are in Rhoda's room. They are deciding whether or not to play a game.

Rhoda: Let's play a game.

Annie: Okay. I want to stay inside. It is raining.

Rhoda: Okay. Let's play checkers.

Annie: I'll turn on the lights. That way we can see better.

Rhoda: Well, I.....

Annie: What is wrong?

Rhoda: I don't use my lights very much.

Annie: But we need them to see

LESSON 2-2: STORY 2-2

THERE NEEDS TO BE A LAW

It was winter in Indiana, and it was cold. It was cold outside, and inside. People in Indiana did not have coal. They used coal to make electricity for lights and heat.

People who mine coal in Indiana and other states had stopped. They wanted to get more pay for their work. They also wanted to be able to stop working if there were dangers. Mining is very dangerous work. The miners would not accept a new contract until their safety was guaranteed.

The electric company had asked people to cut back on their use of heat and lights during the work stoppage. Mary's parents did. So did some of their neighbors. They turned down their heat to 60° and everyone wore sweaters. They used fewer lights, and watched TV less often. The schools also turned down their heat and turned off many lights.

As Mary's parents were driving through town, they saw the lights on in some businesses. They were angry. They thought that people should turn their lights off. They needed the electricity for heat in their home.

Mary's dad called the city government. The chairman of the city council was an old friend. The chairman was sympathetic to his position. The neighbors signed a petition and presented it to the council at their next meeting. Many other important community members spoke in favor of the law to turn out lights in town.

The city government then passed a law that only one sign could be lighted in a business.

Mary's dad was happy. So was Mary. It was better this way. It would be much better when the coal miners went back to work, but the energy problem would not go away. Mary and her family hoped some of the lights would never be turned on again so that energy could be saved.

LESSON 2-2: STORY 2-3

THE SCHOOL BUS

Pete and Jimmy rode the school bus every morning. They enjoyed it. It was a short ride, and a nice way to go to school.

Sam did not ride the school bus. His parents drove him to school. The school did not have enough buses, and students in Sam's area could not use the bus service.

Pete knew that cars used a lot of gasoline. He was concerned about energy. He talked with his father. His father said that the school board was in charge of deciding to buy buses and determining where they went. They could make it possible for Sam to take the school bus.

Pete's father talked to Sam's father. Sam's father owned one of the grocery stores in town. His friend who owned the store with him was on the school board. They talked with Sam's father's friend. The school board brought the issue up. They had some money they could use to buy more buses. Sam's father, many students in Sam's school, and the president of the P.T.A. were all in favor of new buses.

The president of the P.T.A. made an eloquent speech in support of new buses. Sam presented a poll taken by the students which showed that they wanted the buses. The city Good Government League offered to help by paying half of the cost of the new buses with money they raised from citizens. The board voted in favor of the buses, and changed the bus route so that Sam and other students could take the bus.

Pete was pleased. Now they could ride to school with Sam, and save energy at the same time.

LESSON 2-2: STORY 2-4

BIG GOVERNMENT

President Carter wanted to save energy. He thought that cars used too much energy. He also thought that people used too much energy in heating their homes. He presented his ideas to Congress, which then had to make decisions.

Congress would decide. Many people in Congress were in favor of saving energy. Yet they disagreed about how to do it. Some wanted to tax people who used a lot of energy by making them pay more for big cars or gasoline. Others did not. Some wanted to regulate the producers of energy so that some forms of energy, such as coal, would be much cheaper than others, such as oil. Others disagreed.

Congress had a hard time deciding. Susie's parents wrote to their representative in Congress. They wanted to help make a decision to save energy. Other people in Susie's town wrote also. Susie's class wrote their ideas to their representative. Their representative listened to all their ideas, and became much more involved in the debate over taxing and regulating energy.

It would take a long time for Congress to make a decision, but Susie and her parents and neighbors had helped. Meanwhile, people like Susie would have to do their best to save energy in whatever way they could.

LESSON 2-6: ENERGY AND YOUR VALUES

Rationale

In order for students to see the value choices they make in their energy project activities, they need to come to grips with their own values. They need to be able to see what values they have, and apply them to their decisions about energy.

This lesson focuses on valuing. It is a skill lesson. Valuing is the heart of making decisions about energy. Our purpose here is to have students value energy and to apply their values to decision-making about energy alternatives.

Objective

Students will acquire basic valuing skills in making energy decisions. This skill can be assessed by students' responses to the issues in Activity F of this lesson.

Main Activity

A. Talk with students about how some things are valuable to them. Some things they can see, such as money or a new bicycle. Other things are less obvious. Some people value friendship. Others value truth. Have students make a list of the things that they think are valuable in their lives.

B. Talk with students about how things are valuable because they have values, or principles or ideas that they live by that are important to them. Ask students to create their own list of values, or ideas, which they think are important in guiding their lives. Their list might include democracy, friendship, truth, justice. Have students feel free to create as long a list as they want which identifies their important values. Discuss with students how their values may conflict. Be sure to save this list on the blackboard.

C. Talk with students about how energy also involves values. Making a decision to turn off lights or not to use heat involves basic values about saving, about sharing with others, and basically, about truth, friendship, and democracy. Have students make a list of values that they think are involved in making decisions about energy. Put this list on the board next to the list that they have made in Activity B.

D. Now have students gather information from newspapers or magazines about energy. For the story or the picture that they gather, have them indicate which values they think are important in the issue or problem or situation that is being described.

or

Bring someone into the class who can talk with students about energy problems and the basic values tht they think are important to saving energy.

or

Ask students to collect or draw cartoons depicting an energy problem and the basic values that are involved in solving it.

E. Tell students thac the principal way in which values become involved in action on energy issues is in making decisions. Every time a decision is made, a choice is made between different ways of doing things. For example, in turning out the lights, or leaving them on, students make a basic decision. If they turn out the lights, it is usually because they are expressing a value, such as saving. If they leave the lights on, they are normally expressing a value which involves seeing, or feeling comfortable, or not caring about spending money or using electricity. Describe for students a situation in which they have a choice as to whether or not to use the lights, and then guide a discussion with the following questions:

1. What values are involved in the use of lights? (i.e saving energy, helping others now and in the future)

2. How do those values help you choose the way you are going to use lights? (i.e. they are more important than having a lot of light)

3. How do those values help you see what the outcome of using the lights will be? (i.e. I know I will save energy in accordance with my values.)

F. Divide students into groups, and have each group select a particular issue. The issue might be heat, the use of cars, the use of paper, plastics, or television. Students can pick their own energy-related issues. Have them think about what values are involved in using the energy, how the values help them to choose what they will do with the energy, and how the values help them to see the outcomes of what will happen if they use the energy.

Then hold a class discussion around the following questions:

1. What values were involved in these issues?

2. How did the values help you in making a choice about how to use the energy?

3. How did the values help you to see the outcome of using the energy?

4. Why were one group's values different from or similar to others?

Be sure the students understand that people's values differ and they need to have respect for others' values. When any individual or group makes a choice, it may be based on a different set of values than that of another group. The important thing here is that people realize what their values are and use them as guides in making decisions.

G. Have students outline one thing they think they can do to save energy and the ways that their own values enter into decisions they make about their energy projects. Work with students in listing their values that are relevant to their energy problem. Discuss with them whether or not their values are upheld by the activities they have planned. Help them to determine the outcomes of their activities and whether their values continue to be upheld.

Grade Level Adaptation

K-1: Have students focus on one value, such as "saving." Work with them to see how they apply their value of saving to the energy situation.

2-3: Use pictures of people saving things to begin this lesson. Talk with students about how saving is an important value. Have them relate saving as a value to one energy decision that they have made or make as an individual or as a class.

Language Arts Adaptation

K-1: Have students use puppets to act out ways of saving energy.

2-3: Have students pick out ways that values enter into energy situations in stories that they are reading.

4-6: Have students write a story about how they have saved energy and the values that are involved.

Math Adaptation

K-1: Have students count how many ways they might save energy.

2-3: Have students see how many people support different values in their class. They might add or subtract, multiply or divide these combinations of numbers they give from their class survey.

4-6: Talk with students about how values can or cannot be quantified, using the math functions that you are currently teaching.

LESSON 3-1: TAKING YOUR OWN ACTION

Rationale

This lesson focuses on students actually taking the actions they have planned for the last five lessons. They will tackle an energy problem in their school, home, or community which they have identified and studied.

This participation activity is the essence of energy education. Students will apply their knowledge and skills to actions that are important to them. They will practice saving energy. It is only through practice that important habits can be changed.

Objective

Students will apply their knowledge of energy and problem-solving to a situation that is important to them. Assessment of achievement of this objective can be made by students' reports in Activity C of this lesson.

Main Activity

A. Review with the students the main dimensions of their energy problem. Either review the class project or review each group's definition of its problem. You should review their situation and discuss the following questions.

1. What is your energy problem? (i.e. turning off lights, saving heat, recycling products, driving fewer miles, organizing a community campaign for saving energy)

2. What actors are involved in your energy problem?

3. What issues are you trying to solve?

4. What actions are you thinking about doing?

5. Why are these actions important?

B. Then help students to plan how to actually take action on the problem they have defined. Have them use the sheet on taking their own action which is enclosed with this lesson. Help them to respond to each of the sections of the form. You may want to talk orally about each of these sections and put the answers on the board. Or you may want students to work in groups. They should, through this discussion, define the problem that they are trying to solve, talk about the information they need in order to

solve it, outline the people who are involved in working on the problem, determine who will do what in tackling the problem, decide at what time each person will take his or her action, and finally, decide on what form the report will take. You should go through each one of these steps with the students, and help them to work out a realistic and well-reasoned plan for taking action on their problem.

C. When students are taking action on their problem, you should talk with them regularly about how they are progressing and the kinds of plans they have made. You may want students to give oral reports to you on a regular basis. You may want them to keep written logs of their activities so that they can remember what they have done. You should be a central stimulus and resource for students as they are carrying out their activities.

D. Have students give reports to the class on their success in taking their own action. They may make these reports in oral or written form, or use visual aids, such as pictures they have made or pictures or articles that have been taken from newspapers or magazines. They can present these reports to other classes in the school or groups in the community via P.T.A., newspapers, etc.

E. When students have completed their reports, have the class as a whole help to make a set of recommendations about how other people might save energy. Write these recommendations on the board. Then have students be sure that letters or memoranda are sent to the proper people who make decisions in this area so that others may learn to save energy. Be sure to report back to students on the responses that are made to their recommendations.

Grade Level Adaptation

K-1: Be sure that the problem that students have is one that they themselves can do something about. Help them with the steps and how to solve that problem. Talk with them individually about their progress in working on their energy problem or have all the students draw their progress on "butcher" paper on the wall.

2-3: Guide students through the steps presented in Section B, one at a time. Be sure that they are thoroughly discussed. Have students make an oral report on the success of their actions.

Language Arts Adaptation

K-1: Have students use a tape recorder to talk about their attempts to take action on an energy problem.

2-3: Have students give oral or written reports on their success in taking energy action

4-6: Have students keep daily logs or slide-tape shows. Structure those logs or slide-tape shows so that you can stress the language arts skills you are now currently teaching.

Math Adaptation

K-1: Have students talk about the energy that they have saved as a result of their action. They can explore the concepts of "more" or "less" or other measurement concepts based on their actions.

2-3: Have students measure the energy that they have saved and talk about how they might save more energy.

4-6: Have students chart their progress in saving energy according to a mathematical function that you are currently teaching. They can include these measurements in their logs on a regular basis.

LESSON 2-6: TAKING YOUR OWN ACTION

1. My Energy Problem _____

2. Information I need _____

3. People _____

4. Who Will Do Things _____

5. When We Do Things _____

6. Report _____